ANTENATAL DEPRESSION:

PREVALENCE AND DETERMINANTS

IN A HIGH-RISK SAMPLE OF WOMEN IN SASKATOON

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ABSTRACT

Pregnancy is often portrayed as a happy time for the woman and her family. In reality, many women struggle with negative emotions and moods that can have deleterious effects on the mother, the fetus, and the growing family. Depression is an increasing, worldwide problem, with women in their childbearing years and those of low socioeconomic status the most vulnerable.

This study explores depression, as determined by the Edinburgh Postnatal Depression Scale (EPDS), in a high-risk sample of pregnant women enrolled in two prenatal programs in Saskatoon, Saskatchewan, Canada. A prevention and population health approach has been used to identify potential determinants and implications of antenatal depression. The data analyzed in this study were from the first cross-sectional portion of a longitudinal, epidemiological study of depression in pregnancy into the postpartum. Women were invited to participate in the study at their first prenatal visit. Data were collected by program staff.

The prevalence of depression in this sample of 402 high-risk women was 29.5%, which is similar to other studies of inner-city, low income, and minority women elsewhere in the world. In the final model, antenatal depression was associated with a history of depression, moods going up and down, current smoking status, high levels of stressors, and social support.

Factor analysis of the EPDS revealed three underlying factors: Anxiety, Depression, and Self-harm thoughts. The anxiety factor explained most of the variance in the overall EPDS scores in this sample of women. A history of problems with mood fluctuations was significantly associated with anxiety and depression subscales and self-harm. Significantly more women aged 21 and under experienced anxiety, and more Aboriginal women experienced depressive symptoms and self-harm thoughts. Twenty percent of women reported self-harm thoughts in the preceding seven days. Depressed, Aboriginal, and single women, and women who use alcohol were most at risk for self-harm thoughts.

The level of depressive symptoms in this sample of women represents a significant public and mental health problem in women already challenged by inequities in their life circumstances. We need to develop public health policy that will support

screening and identification of women with depression. Interventions at the primary, secondary, and tertiary levels of prevention can help to improve the health of women struggling with antenatal depression, promote the optimal intrauterine environment for their unborn children, and reduce the intergenerational transmission of depression.

DEDICATION

This work is dedicated to:

My daughter, Lindsay Hauser.
Always with me

My son, Michael Hauser (November 1, 1979-October 18, 1994).
Forever in my heart

And my dear, sweet, little Sidney

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DEFINITIONS[1]

Antepartum	-	Before birth
Antenatal	-	Before birth
Determinants	-	Factors that impact on health,[2] including • the social and economic environment • the physical environment • the person's individual characteristics and behaviours
Gestation	-	Development of the fetus from the first day of the last period until birth, 40 weeks.
Multigravida	-	Woman who has had more than one pregnancy
Multipara	-	Woman who has given birth to more than one viable child
Primipara	-	A woman pregnant with her first child
Prenatal	-	Before birth
Postnatal	-	A period not less than 10 days and no more than 28 days following delivery
Postpartum	-	The first 6 weeks after delivery, but up to one year when discussing Postpartum Depression[3]
Primigravida	-	A woman who is pregnant for the first time

[1] Tiran D. (1997). Midwives' Dictionary. (9th ED). London, UK: Bailliere Tindall
[2] WHO. The Determinants of Health. http://www.who.int/hia/evidence/doh/en/
[3] Brockington I. (1996). Motherhood and Mental Health. Oxford: Oxford University Press.

ABBREVIATIONS

ACTH	-	Adrenocorticotropic hormone
AD	-	Antenatal Depression
Apgar	-	Appearance, Pulse, Grimace, Activity, Respiration
BCP	-	Birth Control Pill
BDI	-	Beck Depression Inventory
CES-D	-	Center for Epidemiologic Studies Depression Scale
CI	-	Confidence Interval
CIDI	-	Composite International Diagnostic Interview
Crystal Meth	-	Crystalline Methamphetamine
CUISR	-	Community-University Institutes for Social Research
DALY	-	Disability Adjusted Life Years
DOB	-	Date of Birth
DSM-IV	-	Diagnostic and Statistical Manual of Mental Disorders, 4th Edition
ECT	-	Electroconvulsive Therapy
EPDS	-	Edinburgh PostNatal Depression Scale
FASD	-	Fetal Alcohol Spectrum Disorder
FHR	-	Fetal Heart Rate
G P T P A L	-	Gravida, Para, Term, Preterm, Abortion/miscarriage, Living
HAD	-	Hospital Anxiety and Depression Scale
HMHB	-	Healthy Mother Healthy Baby Program
HIV	-	Human Immunodeficiency Virus
HPA	-	Hypothalamic-pituitary-adrenal axis
ICD-10	-	International Classification of Diseases, 10th Edition
IQ	-	Intelligence Quotient
IUD	-	Intrauterine Device
MADRAS	-	Montgomery-Asber Depression Rating Scale
MAO	-	Monoamine oxidase
MDQ	-	Mood Disorders Questionnaire
n	-	Number
OR	-	Odds Ratio
p	-	probability of obtaining a result at least as extreme as a given data point, assuming the data point was the result of chance alone
PHQ	-	Patient Health Questionnaire
PIH	-	Pregnancy Induced Hypertension
PPD	-	Postpartum Depression
PPV	-	Positive Predictive Value
PRIME-MD	-	Primary Care Evaluation of Mental Disorders
RDC	-	Research Diagnostic Criteria
RR	-	Relative Risk
SADS	-	Schedule for Affective Disorders and Schizophrenia
SCID	-	Structured Clinical Interview for DSM-IV Axis I Disorders
SCL-25	-	Hopkins Symptom Checklist
SHR	-	Saskatoon Health Region

ABBREVIATIONS

SIDS	-	Sudden Infant Death Syndrome
SPI	-	Standardised Psychiatric Interview
SPSS-14.0	-	Statistical Package for the Social Sciences, Version 14
SSRI	-	Selective Serotonin Reuptake Inhibitors
STAI	-	State-Trait Anxiety Inventory
STI	-	Sexually Transmitted Infection
T-ACE	-	Tolerance, Annoyance, Cut-down, Eye-opener
TWEAK	-	Tolerance, Worry, Eye-opener, Amnesia, Cut-down
UTI	-	Urinary Tract Infection
WAST	-	Woman Abuse Screening Tool
WC	-	Westside Clinic
WHO	-	World Health Organization
YLD	-	Years Living with Disability
YWCA	-	Young Women's Christian Association

CHAPTER 1
INTRODUCTION

Pregnancy is portrayed as a joyous time. Contrary to this perception, women are at the highest risk for depression during their childbearing years than at any other time in their lives.[1, 2] Mental health issues are more common than other medical and obstetrical problems that women are routinely screened and treated for in pregnancy.[3, 4] The prevalence of depression in pregnancy and after birth varies from 10-39%, with inner-city women at the highest risk.[5, 6] According to the literature, single women who live in poverty, and experience family discord or violence, increased life stress, and have little social support are more likely to be depressed.[6-11] However, there continue to be contradictory reports regarding the correlates and determinants of antenatal depression.[12-14]

Pregnant women who are depressed are more likely to use alcohol, drugs, and tobacco and are less likely to have adequate prenatal care, all of which contribute to poor outcomes for the fetus, the baby, and the mother herself.[10, 15, 16] They are at risk for more severe depressions, psychosis, and suicide.[17-20] Their pregnancies end prematurely and have more obstetrical complications.[4]

Depression during pregnancy is particularly significant not just because of the consequences to the health of the mother, but also the potential deleterious effects on the developing fetus.[2] Barker, in his theory of the “fetal origins of adult disease”, hypothesized that the prenatal environment exerts influences on fetal health that, in turn, follow into adulthood.[21] Therefore, furthering our understanding of the prevalence and determinants of depression in pregnancy may be essential to reducing the intergenerational spread of the sequelae caused by depression.

Infants of depressed women are at greater risk for pre-term delivery, low birth weight, failure to thrive, and are breastfed less.[22-25] As children, they experience more growth, psychological, behavioural, and developmental problems.[24-28] Routine prenatal visits offer an ideal opportunity for early detection and intervention of depression;[18, 29-31]

however, neither the full extent nor implications of antenatal depression are usually recognized by the obstetric, mental health, or family practice health services. Consequently, there is no routine screening for depression in pregnancy within the Saskatoon Health Region.

The data analyzed in this thesis were collected as part of a larger, longitudinal epidemiological study of depressive symptoms and associated sociodemographic, obstetrical/biological, psychosocial, and behavioural determinants over the course of pregnancy and into the early postpartum. Staff, clients, and management of two local agencies that provide antenatal and postpartum services to high-risk women in Saskatoon have been involved in the study design, questionnaire development, and data collection for this research project.

It is anticipated that this research will add to the growing body of knowledge about antenatal depression, particularly in high-risk women. Increased understanding about the prevalence and determinants associated with antenatal depression will inform researchers and caregivers about the factors affecting fetal and child development and family well-being. Screening and early intervention of antenatal depression may help to prevent complications for the mother and her baby. It is hoped that the findings will increase awareness of vulnerable pregnant women who are struggling with depression and their life circumstances in our community. Finally, this research will assist administrators in the development of health policy and mental health services for pregnant women in the health region.

1.1 Purpose

The purpose of this project is to increase our understanding of depression in a selected group of low socioeconomic, low education, mostly Aboriginal pregnant women in Saskatoon. It will determine the prevalence, as well as the sociodemographic, obstetrical/biological, psychosocial, and behavioural determinants of depressive symptoms. Determining the prevalence and determinants of depression in pregnancy can help us to target women at increased risk for screening and prevention. There is increased opportunity to anticipate those women at risk for depression and consequently to reduce the impact of antenatal depression on the mother, her baby, and her family.

1.2 Research Questions and Hypotheses

The study will investigate the following five research questions and respective hypotheses. These questions begin with an estimation of simple prevalence rates and then progress to more specific questions to identify the determinants of depression in the sample and in different subgroups of women, and end with an in-depth analysis of the depression scale. The symptom profile of depression in the total sample of women and the different subgroups of women will be explored and compared.

1.2.1 Question 1 What is the prevalence of antenatal depression in this sample of high-risk women and is this prevalence different from rates reported in the literature for comparable groups?

Hypothesis: The prevalence of depressive symptoms in this selected sample of pregnant women will be comparable to prevalence reported in the literature for high-risk women and fall within the range of 25% to 47%.

1.2.2 Question 2 What are the sociodemographic, obstetrical/biological, psychological, and behavioural determinants of antenatal depression in this group of high-risk women?

Hypothesis: Antenatal women with major depressive symptoms will be of lower income, lower levels of education, more single status, and younger, they will have more pregnancies, more abortions, and more somatic complaints, more psychological problems, and engage in more risk behaviours compared to women with no or low depressive symptoms.

1.2.3 Question 3 What are the prevalence and determinants of antenatal depression in Aboriginal women compared to non-Aboriginal women, women 21 and under compared to women 21 and over, and non-partnered women compared to partnered women?

Hypothesis: Aboriginal women will experience higher levels of depression than non-Aboriginal women will. Women 21 and under will experience more depression compared to women over 21. Non-partnered women will experience more depression than women with partners will.

1.2.4 Question 4 Does the Edinburgh Postnatal Depression Scale develop into constituent measures of depression, how do they contribute to the overall score, and

what are the determinants associated with these constituent measures in this sample of high-risk women?

Hypothesis: The Edinburgh Postnatal Depression Scale will have more than one underlying factor. These factors will have unique contributions to the depression score and will have different associations with the determinants.

1.2.5 Question 5 Are the constituent measures on the Edinburgh Postnatal Scale different for the subgroups of women (e.g., younger, Aboriginal, non-partnered)?

Hypothesis: It is hypothesized that there will be differences in the factors of depression in Aboriginal women compared to non-Aboriginal women, women 21 and under compared to women over 21, and non-partnered women compared to partnered women.

CHAPTER 2

LITERATURE REVIEW

A review of antenatal depression was written for the *Canadian Nurse*.[32] Chapter 2 describes the epidemiology and signs and symptoms of depression. The prevalence and determinants of depression and anxiety in pregnancy, particularly in high-risk women are discussed. The chapter ends with the effects of depression on the woman, the pregnancy, the fetus, the child, and the family.

2.1 Epidemiology of Depression

The World Health Organization (WHO) estimates that by the year 2020, depression will be the second greatest cause of disease burden in both sexes. [33] Sadly, it is already the leading cause of disease burden in women aged 15-44 worldwide.[33] In Canada, depression is a major public health problem that affects up to 7% of all women, with a lifetime prevalence in women of 12.3%.[1] Women have twice the risk of experiencing depression in their lifetime than men.[1, 2] This difference begins early in puberty, around the start of the menarche, and it remains highly elevated until after the menopause, but still does not return to the level of men.[1] Women are more likely to be depressed during pregnancy, or in the postpartum period, or throughout pre and postpartum than at any other time in their lives.[1, 2]

2.2 Depression

Depression is an emotional or affective state where a person may feel sad, lonely, or miserable with a “lack of interest” in their usual pleasurable activities.[34] The stimulus for depression can range from an appropriate response to loss or trauma, life situation, a vulnerability rooted in underlying genetic make-up, or complex biological causes.[17], [35, 36]

It has been posited that genetics play an important role in the development of depression.[35] There is a 25% to 33% increased rate of depression in first-degree relatives of people with depression, with the lifetime risk of depression in children of depressed

parents ranging from 15-45%; but depression also occurs in people with no family history.[35, 36] The XX female genetic composition (compared to the male XY) may also increase a woman's susceptibility for depression.[35, 36]

Changes in the levels of female sex-related hormones (i.e., estrogen, progesterone) at adolescence, during menstrual cycles, throughout pregnancy, at postpartum, and into menopause are often blamed for the discrepancy between the rates of depression in men and women, particularly throughout the childbearing years.[37] Estrogen is believed to have effects on neurotransmitters, including serotonin, which are directly associated with depression and are also linked to anxiety.[37, 38] Women also have differences in thyroid function, cortisol, monamine oxidase transmitters (MAO), and adrenocortiocotropic hormone (ACTH), which may increase susceptibility for depression. The different hormones and neurotransmitters are also shown to have a sex-differentiated effect on the hypothalamic-pituitary-adrenal axis (HPA), which modulates mood in response to stress.[37-39]

Along with genetic and biological vulnerability, early stress such as life traumas (e.g., loss of parent or abuse) are linked to changes in the central nervous and endocrine systems, which are detrimental to the hippocampus and also further increase the risk for depression.[40]

2.3 Signs and Symptoms of Depression

According to the American Psychiatric Association (APA), a diagnosis of major depressive disorder exists if a person experiences five or more of the following signs or symptoms in a two-week period. At least one of the symptoms must be either depressed mood or anhedonia (severely diminished interest or pleasure in activities that were previously enjoyable) and the person must have some impairment to their life:[17, 41]

- Depressed mood most of the day
- Anhedonia
- Significant weight loss or gain of more than 5% of body weight in 1 month
- Insomnia or hypersomnia almost every day
- Psychomotor changes as observed by others (restless, agitated, or slowed)
- Fatigue or diminished energy level
- Feelings of worthlessness or excessive or inappropriate guilt
- Decreased concentration or indecisiveness
- Recurrent thoughts of death, a suicide plan, or attempt

A person who has at least two, but no more than five, of the above symptoms for two weeks, with one of the symptoms being depressed mood or anhedonia, may have minor depression.[34] The signs and symptoms of depression in pregnancy do not differ from the signs and symptoms of depression at any other time.[42, 43]

2.4 Antenatal Depression

Traditionally, pregnancy was viewed as a time protective against developing depression; consequently, the existence and consequences of antenatal depression (AD) have received little attention in either obstetrical, psychiatric, family medical practice, or mental health services.[19, 44, 45] However, melancholia in pregnancy was noted as early as 1840.[19, 46] As recently as the 1970 s, the elevated progesterone and estrogen levels associated with pregnancy were viewed as protective for depression.[19, 47] Kendell further contributed to the impression that pregnancy is a time of low psychiatric problems.[46] He studied admissions to psychiatric units in 2,000 women throughout the antenatal and postnatal period and found the rates lowest in the second trimester of pregnancy of all the perinatal period. Kendell credited the low rate of hospitalizations, particularly for psychosis, to a lack of psychiatric problems during pregnancy; however, he did not include admissions to obstetrical wards or other units, which may have biased the findings.[19, 48]

Focus on the physical well-being of the mother and fetus, and attributing a woman's complaints (such as fatigue, appetite, and weight changes) to the physical or hormonal changes of pregnancy can mask the symptoms of depression and has probably contributed to an under-diagnosis of antenatal depression.[47, 49, 50] Kelly et al. confirmed that somatic complaints may not all be normal manifestations associated with the pregnancy, with the number and intensity of somatic symptoms significantly increased in depressed compared to non-depressed pregnant women.[49] Therefore, increased amount or excessive severity of physical complaints during pregnancy should alert care providers to assess women for depression rather than dismissing them as typical symptoms associated with pregnancy.[49, 50]

Pregnancy is a time associated with unfolding and changing physical and psychological challenges, unique in each of the three trimesters. The first trimester begins at conception and lasts until 13 weeks gestation. The pregnant woman may experience

fatigue, nausea, vomiting, altered appetite, and physical changes. She may be ambivalent about the pregnancy. There is emotional lability with increased forgetfulness and introspectiveness and the woman may experience depression. In the second trimester (weeks 13 to 26), the pregnancy becomes obvious as the uterus rises out of the pelvis. There is a decrease in physical complaints. The woman becomes increasingly pensive; she fantasizes more about the baby, and her attachment to the fetus increases as she experiences the fetus move inside her. A woman is likely to be psychologically and physically robust; it is purported by some to be the least probable time for depressive symptoms in either pregnancy or in the postpartum period.[48] The third trimester (26 weeks to delivery) usually brings increased complaints of fatigue, low energy, and insomnia due to increased fetal activity and physical discomforts. The woman may be very self-absorbed and may experience increasing anxiety about the birth and impending motherhood. A woman is assumed to be more susceptible to depression now than at any other time in pregnancy.[19, 48, 51, 52]

There is an assumption that pregnancy is a time of increased emotionality with expectations of frequent fluctuations in mood.[53] However, mood swings may not necessarily be normal and are often associated with increased emotional distress and irritability as well as increased comorbidity of psychiatric problems such as borderline personality, anxiety, and depression.[54, 55]

In a recent systematic review of antenatal depression, Bennett et al. analyzed 21 studies. Many of these studies did not have antenatal depression as the main outcome measure nor did they all include women in early pregnancy.[5] As Table 2.1 shows, the prevalence of antenatal depression varied greatly from 7.4% to 51.4% in general populations of pregnant women. The studies used a variety of depression screening tools and it is not clear whether all of these tools were adjusted for the somatic complaints that may confound the symptoms of depression in pregnant women. The prevalence of antenatal depression was less variable, although consistently high, among the low-socioeconomic status women.

Table 2.1 Prevalence of antenatal depression[5]

Prevalence	1st Trimester	2nd Trimester	3rd Trimester
General population	7.4 - 24.6%	9.1 - 48.9%	8.8 - 51.4%
Low-socioeconomic	Not available	28 - 47%	25 – 39%

In one of the larger studies of antenatal depression in primary care, Marcus et al. reported a prevalence of 20% in 3,472 pregnant women (mean gestation 25 weeks). This estimate falls within the range as reported in the systematic review for the second trimester. Further, the researchers found that only 13% of those women identified as depressed were receiving care for the depression.[56] The Confidential Enquiries into Maternal Deaths (CEMD) in the United Kingdom determined that 12% of all maternal deaths (death during pregnancy and in the first year post delivery) could be ascribed to psychiatric illness, with suicide the leading cause of death, surpassing all medical or obstetrical problems.[57]

In addition to the usual predictors of depression, antenatal depression has been uniquely associated with a history of previous abortions, ambivalence towards the pregnancy, including thoughts of abortion, and anxiety about the fetus.[19, 58]

2.5 Anxiety in Pregnancy

Anxiety disorders are amongst the most prevalent of the psychiatric disorders, affecting approximately 16% of women in Canada, with some epidemiologic studies estimating a 30% lifetime prevalence.[59-61] There is limited study or awareness about the prevalence of anxiety during pregnancy. Women's reporting of excessive worry or anxious feelings may be treated by caregivers as the normal concern of expectant mothers rather giving them a proper examination of their symptoms for anxiety. In a study of 8,000 pregnant women in Great Britain, 21.9% had anxiety symptoms [62] and 24.1% of 497 women in France were reported to suffer with anxiety during pregnancy.[63]

Anxiety is an important feature in the research and understanding of depression. A temporal relationship has been identified between anxiety and the subsequent development of depression in some people.[64] Consequently, identifying and treating anxiety may help to prevent depression.[64, 65] This is particularly relevant in childbearing women as anxiety during pregnancy has been identified as an important precursor to postpartum depression.[63] Women who experience anxiety are up to three times as likely to report severe postpartum depression symptoms compared to women without anxiety.[62, 63, 66]

2.6 Depression in High-Risk Pregnant Women

Women who are non-partnered, with low socioeconomic status, low education, or ethnic minorities may face many challenges that compromise their ability to have healthy pregnancies and may possibly put them at increased risk for developing depression.[7, 12, 67] Several studies of pregnant women in predominantly inner-city, low income neighbourhoods have reported on the prevalence and correlates of depression in high-risk pregnant women.[6, 12, 67-69]

Bolton and associates screened and examined 407 inner-city pregnant women in London, UK; 29% screened positive for a clinically significant depression.[67] The single women were 2.43 times more likely to be depressed than those with live-in partners were; women with low support from their partners were more than twice as likely to be depressed as those with more supportive partners. Unemployed women had a 2.35 times greater risk for depression than those who were employed. Multiparous women were 2.62 more likely than first time mothers to be depressed, and those who did not complete high-school had 3.40 times the risk of depression than those who had completed school. The authors concluded that there should be increased emphasis on education to increase a woman's chances of employment, which might in turn improve their outlook and counter depression. Some women in the sample were from more affluent neighbourhoods, which may have affected the associations.[67]

A study of 192 high-risk pregnant women in Ohio focused on the association between socioeconomic status, marital status, and ethnicity and depression.[12] Women were paid for their participation in the study, which included three interviews, two in pregnancy and one in postpartum. Depression was assessed using the Schedule for Affective Disorders and Schizophrenia (SADS), adapted for use in pregnancy. They also confirmed the diagnosis using the Research Diagnostic Criteria (RDC) with a shortened version of the Beck Depression Inventory (BDI). Over 40% of the women met their criteria for depression on either of the two antepartum assessments, with point prevalences of 27.6% and 24.5%, dropping to 23.4% in the postpartum. Thirty percent of women depressed antenatally remained depressed into the postpartum. Only single, non-cohabiting status was associated with depression in the women. The study had a large loss to follow-up, especially among Black women, which may be the reason that the study did

not find an association between depression and ethnicity, single status, or low socioeconomic status in this group.[12]

In a Brazilian study, over 37% of 29 inner-city women screened positive for depressive symptoms during pregnancy.[6] Researchers only found a significant association between Black ethnicity and depression in this high-risk group. The prevalence of depression was 13% at three months postpartum, which is consistent with rates in the general pregnant population; however, 43% of the women experienced at least one episode of depression in the first six months post delivery.[6] The small sample size limits generalizability of the findings but does point to a high point prevalence of depressive symptoms in this population of women.

Also in Brazil, Lovisi et al. looked at depression, poverty, and violence in 230 pregnant women in a public hospital maternity clinic.[69] They determined the prevalence of depression at 19.1% using the Composite International Diagnostic Interview (CIDI), a tool not specific to screening pregnant women. Almost 60% of the pregnancies were unplanned, and 29.9% were primiparous. These factors were positively associated with depression in the bivariate analysis. Divorced or widowed women were almost five times more likely to be depressed, and the women with a history of depression had 7.9 times the likelihood of antenatal depression. The loss of intimate relationship, financial difficulties, and family violence in the previous year were all significantly associated with depression. Education beyond primary school was protective for depression. The women reported a lack of emotional and social support, but there was no association between support and depression. The authors reported that this population of women is representative of other similar-sized maternity hospitals in Brazil.

Kim et al. studied the association between prenatal care, psychiatric illness, and the sociodemographic characteristics of 154 inner-city women in a mid-western city in the United States.[70] Eighty percent of the women were of ethnically diverse backgrounds (e.g., 32% African American, 31% Hispanic, and 7% Native). Study tools were available in English and Spanish. Almost two-thirds of the women were single and 65% had completed high-school. Thirty-one percent of the women screened positively for psychiatric illness and/or substance abuse problems, 26% were diagnosed with depression and 10% met the criteria for anxiety using the Primary Care Evaluation of Mental

Disorders (PRIME-MD). The PRIME-MD is validated for detecting psychiatric problems; however it is not confirmed for use in pregnant populations.

The researchers found that a history of psychiatric problems, but not current psychiatric illness, was associated with delayed and inadequate prenatal care, with 44% of women initiating prenatal care as late as 16 weeks gestation with ongoing inadequate prenatal care. This compares negatively to the American national goal for 90% of women to initiate prenatal care in the first trimester (<13 weeks gestation).[71] Women in this study with positive psychiatric screens were more likely to report stressors involving the partner, finances, and social isolation as well as health and weight concerns.[70]

In a study of 130 low-income women (16-28 weeks gestation) in an urban prenatal clinic in the Midwestern U.S., 27% of the women met the criteria for depression using the Beck Depression Inventory-II (BDI-II).[68] The Beck Depression Inventory is a well-used scale for depression screening,[72] but the authors do not state if they have adjusted it for use in perinatal women in this study. Sixty percent of the participants were African American, 58% were partnered, 33% had not completed high-school, and 78% were receiving Medicare (public health insurance). Depression was significantly associated with high levels of stress and high religiosity and with low levels of self-esteem and social support. While 25% of the African American women screened positive for depression compared to 33% of the Caucasian women in the study, this was not a statistically significant difference. There were significantly higher levels of depression, lower self-esteem, less resources, and lower religiosity but no other differences in the younger group of women.[68]

The make-up of these high-risk populations is specific to their locale and many have small sample sizes (see Appendix A). There is limited research in high-risk populations of pregnant women in Canadian studies that include Aboriginal women.

In the Saskatoon Pregnancy and Health Study (SPHS), Muhajarine studied the determinants and consequences of risk behaviours in 452 women in Saskatoon in 1993-1999, 40% of whom were identified as high-risk. He used the Brief Symptom Inventory (BSI), a general psychiatric symptom questionnaire, and reported that 33% of the women felt moderately lonely or blue in preceding month.[73] Roots and Wings was a study of aggression and abuse in a subgroup of 500 primiparous (first time pregnant) women and

those with later born children (born to women who had not borne a child 10 years since the last one), in a high-risk population in Saskatoon in 2001. They also used the BSI and reported a depression rate of 48.6% and 40% anxiety.[74] The BSI was not adjusted for use in pregnancy in either of these studies.

The high prevalence rates of anxiety and depression in pregnancy are a great concern for the health of women; however, there is also the potential for widespread negative impact on the developing fetus and the growing family.

2.7 Effects of Depression

2.7.1 Effects on the woman and the pregnancy

Pregnant women who are depressed experience deteriorating social function, and they are more emotionally withdrawn, express excessive concern about the pregnancy, and their ability to parent.[11, 75] They use tobacco, alcohol, and drugs more often, all of which are known to affect placental function and fetal growth.[15, 76, 77] Women with depression are less likely to attend regular obstetric visits, comply with prenatal advice, or take prenatal vitamins, and they are less informed about the benefits of folic acid than non-depressed women are.[10, 16, 70] Pregnant women who are depressed are more likely than non-depressed women to abuse their fetus through physical assault such as punching the pregnant abdomen, by engaging in risk behaviour such as substance abuse, or by not attending to their physical health.[78]

Untreated depression can lead to psychosis.[37] The prevalence of antenatal psychosis is unreported and it is believed to be rare;[79] however, postpartum psychosis affects between 0.1- 0.2% of women.[37] Psychosis is a serious illness: psychotic women experience hallucinations and delusions,[19] are out of touch with reality, and are at increased risk for suicide and homicide.[46, 57]

The rate of suicide in pregnancy is low, with highest rates sometimes reported in younger women[57, 80, 81] but this does not mean that pregnant women do not have suicidal or self-harm thoughts. In a review of suicidality in perinatal women, Lindahl et al. reported approximately 14% of pregnant women have suicidal ideation.[80] They concluded that social support, contact with health care providers, and concern for the unborn child work together to reduce the chance of suicide.[80] In two separate studies,

when women who were depressed were asked about self-harm thoughts, 40% report self-harm ideation in the past week at their first prenatal visit.[81, 82]

Depression is associated with increased medical problems, such as an increased risk of gastrointestinal problems including Irritable Bowel Syndrome,[83] cardiac, and other medical problems.[84] Chronic depression is associated with dilated ventricles and smaller hippocampal volumes in the adult brain.[85] There are disturbances in serotonin and norepinephrine levels, which, along with the increased cortisol levels, furthers the risk for depression and the cycle of depression continues and worsens.[40]

Lack of sleep is linked to an overall lack of well-being, poor decision-making, irritability, distorted perception of events, loneliness, anxiety, substance use, and increased postpartum psychosis.[86] Sleep in pregnant women may be interrupted by fetal movements or physical discomfort and would be increasingly disrupted if a woman was also anxious or depressed.[86-88] In addition to the physical effects of depression, the expectation to feel happy during pregnancy and after birth of a baby may create confusion and guilt for women who are already feeling vulnerable.

Stress, anxiety, and depression cause the release of maternal corticosteroids such as cortisol[89] as well as catecholamines.[25, 90] These substances are believed to cause decreased uterine artery blood flow and uterine irritability, which may contribute to the increased rates of pre-term delivery observed in anxious and depressed women.[91-94] Maternal mental health problems, such as antenatal depression, can alter uterine neuroendocrine and hemodynamics.[4, 95, 96] These changes can increase the risk of complications in the pregnancy such as a triple the rate of pre-eclampsia,[97] diabetes,[3] 2.5 times the chance of having epidural anesthesia,[4] and more than double the rate of operative deliveries such as Caesarean Section or use of forceps.[4]

2.7.2 Effects on the fetus and the child

Fetal and maternal endocrine levels are highly correlated: increased levels of maternal cortisol influence gluccocorticoid receptors in the fetal brain and cause an exaggerated pattern of stress response in the fetus itself.[25, 90, 96, 98] Prenatal exposure to increased glucocorticoids has been associated with increased risk of cardiovascular, metabolic, and neuroendocrine disorders in later life in animal models.[99] Animal studies have also shown stress, anxiety, and depression in the mother can alter development of

the fetal Hypothalamic-Pituitary-Adrenal (HPA) axis. This can lead to abnormal development of neural structures and neuron death, and sustained dysregulation of the HPA, which may affect child development and vulnerability to anxiety into adulthood.[100, 101] In one study, the fetuses of depressed women had elevated baseline fetal heart rates (FHR) with a 3.5-fold delay in return to baseline FHR after stimulation.[95]

Newborns whose mothers were stressed, anxious, or depressed in pregnancy are at increased risk for preterm delivery,[93, 102, 103] lower Apgar scores (health assessment of newborns measured at 1, 5, 10 minutes of age) and birth weight,[104] and smaller head circumference.[105] They score lower on development scales-specifically motor tone and activity levels, increased stress behaviours less imitative behaviour, less mature sleep patterns, more irritability, as well as increased norepinephrine levels and decreased vagal tone.[102, 106]

Babies of mothers who were depressed in pregnancy experience increased levels of cortisol and abnormal brain wave activity,[93] and 2.2 times increased rates of admission to the neonatal intensive care.[4] Infants experience less and shorter durations of breastfeeding,[107] a three-fold increase in colic,[108] more crying and fussy behaviour,[109] increased rates of failure to thrive[22] and Sudden Infant Death Syndrome (SIDS).[23] Mothers who are depressed are less responsive to their baby's cues,[110, 111] and babies of these mothers are less receptive to their mothers,[102] both of which can lead to the onset of attachment problems that can affect the entire family.

Children of mothers depressed in pregnancy are more likely to have behavioural, psychological, and emotional problems such as depression,[112, 113] as well as growth and developmental problems,[113, 114] for example autism.[26] There is also evidence of lower IQ and a decreased ability to cope with stress and to perform adequately in neuromotor tests after exposure to stress and anxiety in utero.[42, 100, 115, 116] Children of anxious mothers have been found to have twice the risk of attention deficit/hyperactivity symptoms (5% to 10%), and up to 15% greater for the most anxious mothers compared with non-anxious women.[117] Adult males and females born to depressed women are 1.5 times more likely to have engaged in criminal activity[118] and females of mothers who experienced depression in pregnancy were found to have more major depressive illness later in life.[119]

2.8 Interventions

Interpersonal therapy, support groups, Electro-convulsive therapy (ECT), light therapy, and medications, especially when used in combination, can be effective interventions for depression.[42, 120-123] Support, particularly of the partner, has been shown to be effective for the prevention and recovery from Postpartum Depression (PPD),[124, 125] however, there is a dearth of literature about effective interventions for antenatal depression.

Elliott et al. studied high-risk women who attended depression support groups in pregnancy and confirmed that they are less likely to develop PPD than those who did not attend support groups.[126] However, 213 pregnant women who were randomly assigned to either an intervention group or no intervention group did not show any difference in depression status at 6, 12, or 24 weeks postpartum. Attendance of the intervention group was only 31%; it was highest antenatally (41%) and lowest at 6 weeks postpartum (24%).[122]

Treatment of antenatal depression, as with any illness during pregnancy, often involves balancing the benefits of treating the mother with the potential of risk to the fetus. This is particularly true when treatment involves medications.

Recent reports from Health Canada support the apprehension that women and caregivers may feel about antidepressant use. In December 2005, they warned of increased risk of congenital heart malformations with use of Paroxetine (Paxil). In 2006, a study of 377 women using Selective Serotonin Reuptake Inhibitors (SSRI) after 20 weeks gestation, found that babies had a 6-fold increase of Persistent Pulmonary Hypertension of the Newborn, a rare but potentially fatal lung disease.[127] Citalopram, another SSRI, was studied in 108 women at the Hospital for Sick Children in Toronto, Canada. Researchers found a four-fold increase of neonatal adaptation syndrome requiring admission to the neonatal intensive care unit.[128] A Canadian study revealed no teratogenic effects or toxicity in 150 babies whose mothers had used the antidepressant Venlaflaxine.[129]

Maternal antidepressant use in pregnancy has been associated with lower Apgar scores, increased respiratory distress, hypoglycemia, preterm delivery, prolonged hospitalizations, and neonatal withdrawal, abstinence, or adaptation syndrome.[130, 131]

Neonatal withdrawal can include jitteriness, irritability, respiratory and feeding problems, and convulsions. These problems are reportedly transitory (up to 48 hours) and manageable with no long-term sequelae identified to date.[132] It might also be that these symptoms are a result of the effects of the depression, other medications used before and during birth, or the delivery itself.[133]

For a woman who has conceived while taking antidepressants, she can be reassured that more than 50% of pregnancies are unplanned and many women do become pregnant while taking such drugs.[134] Pregnancy may not be a good time to either switch or discontinue antidepressant medications as a woman who is getting good relief of symptoms with medication may relapse and be difficult to re-stabilize.[135] Some physicians suggest that antidepressant doses should be tapered prior to delivery to minimize potential withdrawal in the newborn, while at the same time attempting to avert maternal depression.[42, 136]

The Centre for Evaluation to Risks on Human Reproduction extensively reviewed the effects of Fluoxetine (Prozac), a common antidepressant in pregnancy.[130, 137] The Centre concurred with the Canadian Pediatric Association that the risk of antidepressant use before birth outweighs the impact of untreated maternal depression on the fetus.[137, 138]

2.9 Summary

Depression is an important public, mental, and population health concern. Untreated, antenatal depression can be harmful to the health of the pregnant woman, her developing fetus, and growing family. This is especially worrisome when there is increasing evidence that negative influences on the fetal environment can compromise the health of an individual throughout his or her lifespan.

CHAPTER 3

THEORETICAL PERSPECTIVES

The purpose of this chapter is to describe the two underlying theoretical perspectives that have guided this research. The first perspective is a prevention model, which underlies the foundational rationale and implications of the study. The second perspective involves a population health approach, which provides the structure for data collection and interpretation.

3.1 Prevention Approach

Epidemiologic studies such as this one, which focus on subpopulations, can help us to identify factors that put people at risk for disease.[139] There are three levels of prevention to consider: primary, secondary, and tertiary.[139]

The goal of primary prevention is to identify risk factors for a disease before it has occurred, and to intervene on these risk factors to prevent the disease from affecting people.[139] Primary prevention is the essence of community health practice: it enhances quality of life, and decreases morbidity, mortality, and overall health care costs.[140]

Secondary prevention identifies those people who already have disease. Secondary prevention can prevent mortality and complications of the disease through early detection (e.g., screening), intervention, and treatment. Interventions that have focused on modifying these risk factors include prevention on both a primary and a secondary level.[139] Tertiary prevention often occurs after the disease has occurred and has had an impact on the person's level of health. It includes interventions that are rehabilitative, with a goal to help the person attain a new level of wellness as well as ongoing detection.[139, 140]

In the model of levels of prevention for antenatal depression proposed in this thesis, shown in Figure 3.1, the fetus is seen nested entirely within its mother, developing its own biology with the genetic endowment it has received from both parents. The

uterine environment also directly affects the growing fetus, and is under the influence of the mother's health status.

Primary prevention for the fetus as conceptualized in this model involves prevention of antenatal depression through the identification of risk factors in the mother, and the prevention of the effects of antenatal depression on the fetus should the mother become depressed. Primary prevention also requires maternal interventions at the primary, secondary, and tertiary levels.

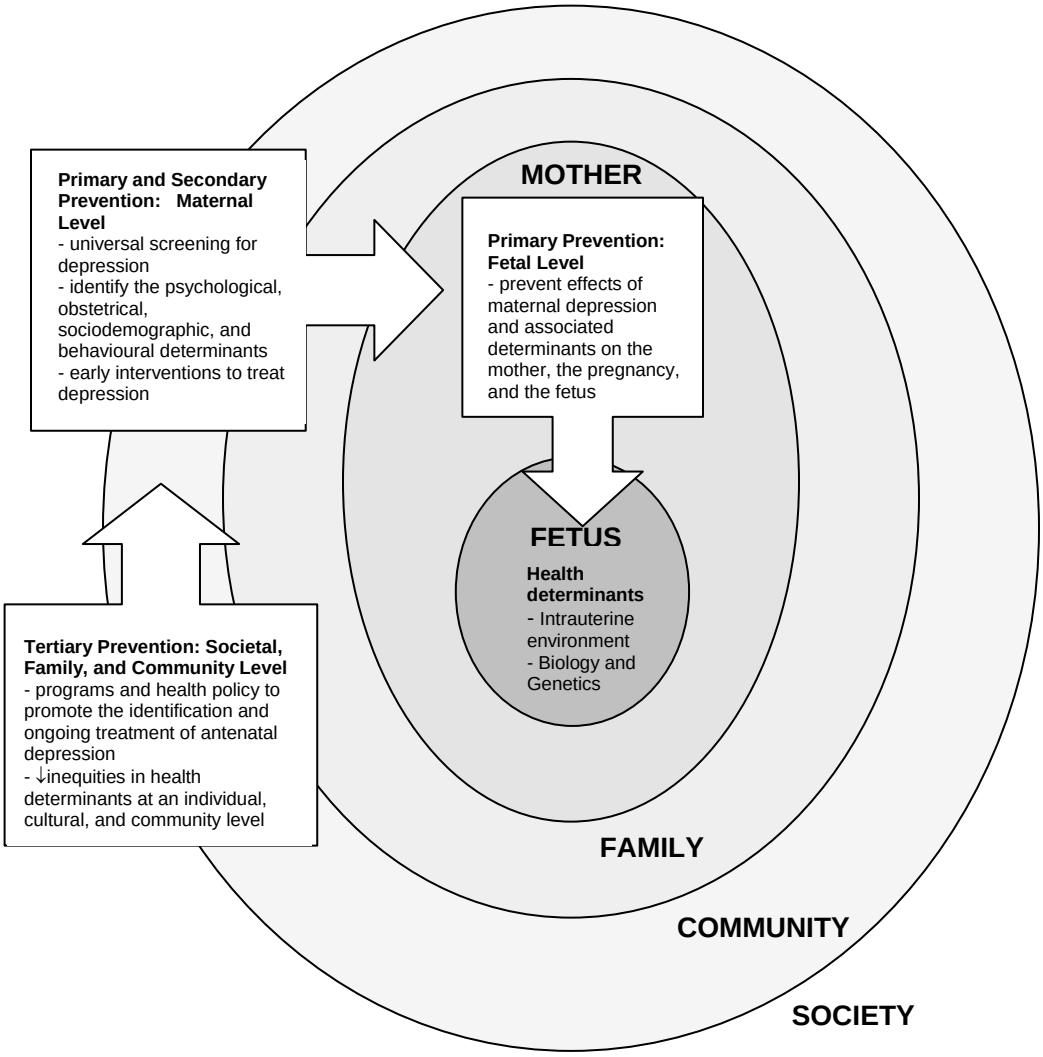
Prenatal and obstetrical care usually follows a biomedical model of assessments and interventions that focus primarily on the physical well-being of the mother and baby.[52] However, secondary prevention of antenatal depression may also thwart the effects of antenatal depression such as complications of pregnancy that affect both the mother and the fetus like Caesarean section, operative and preterm delivery, and gestational hypertension, and worsening depressions in the mother.

Primary and secondary intervention at the maternal level involves universal screening and identification of the psychological, obstetrical/biological, sociodemographic, and behavioural determinants of antenatal depression. If women are found to be depressed they receive the appropriate treatment (pharmacologic, psychological or both) to reduce the depression, but also there must be a concerted effort to ameliorate the associated sociodemographic, obstetrical/biological, psychological, and behavioural determinants associated with depression.

Tertiary prevention involves policy and programming that promotes ongoing screening and accessible treatment of antenatal depression to improve the mental health of the mother. It also needs interventions that lead to a policy and programs that promote the identification, treatment, and rehabilitation from antenatal depression. At a societal level, tertiary prevention will decrease the inequities in health determinants (sociodemographic, obstetrical/biological, psychological, and behavioural) that contribute to antenatal depression at an individual, cultural, and community level.[139]

All of the levels of prevention work collectively to improve the chances for optimal health of the developing fetus, which will in turn promote the prevention of future social and health problems in the growing child into adulthood.

Figure 3.1 Levels of Prevention: Antenatal depression and the fetus



3.2 Population Health Approach

While disease prevention has traditionally included the levels of prevention focused on individual people, a population health approach is a more suitable framework for primary prevention within the community.[140] The purpose of population health is not only to improve and maintain the health of the population, but also to decrease the inequities in health status among different groups of people and to improve the quality of life for the population as a whole over the lifespan.[140] It addresses the determinants of health and highlights the assessment of health status inequalities, the interaction between and among determinants, evidence-informed decisions, and the root causes of illness.[140, 141]

The World Health Organization (WHO) defines disability as the number of Years Lived with Disability (YLDs), and reports that it is a key factor in determining the overall health status of a population. In 2000, the WHO ranked depression as the fourth greatest contributor to disability worldwide, responsible for 3.7% of total global disease burden as determined by the Disability Adjusted Life Years (DALYs-sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability) in both sexes in the 15-44 age group.[33] However, depression, according to the WHO, is already the number one cause of disability in women worldwide.[142]

Health determinants are factors that work together to influence health beyond the usual health services and illness to include a person's social, economic, and other life circumstances.[143] The determinants that have previously been used to try to explain women's susceptibility for depression include: biology/genetics, environment, psychological disposition, and socioeconomic status.[39] The WHO states that the identification and modification of the social factors that influence women's mental health offers the possibility of primary prevention of depression.[144]

Population health requires significant attention to multiple determinants of health.[145] A population health approach to depression research and services focuses attention on root causes (e.g., poverty) and solutions. Population health also includes policies and strategies, which deal with the wider influences of social inequalities such as income distribution and education on health. This practice may have more impact on health than just relying on the usual biomedical approaches, which have traditionally had

a narrower focus on health of the individual, through means like changing unhealthy behaviours and attending treatment.[141]

Population health is a fitting approach to the study of depression during pregnancy, particularly in high-risk women, but the literature offers a mixed and sometimes contradictory account of the factors associated with antenatal depression. For this study, a population health approach has been used to examine the depression status and the risk factors and correlates of depression in pregnant women.

The population health approach shown in Figure 3.2, recognizes that there are determinants of health that work together at multiple levels and involvement to affect health status of the mother and consequently the well-being of the fetus and future adult. The anticipated determinants of antenatal depression are grouped and named as sociodemographic, obstetrical/biological, psychosocial, and behavioural. Each determinant is discussed in more detail, in relation to its role in this study, in Section 4.5.3 of Chapter 4.

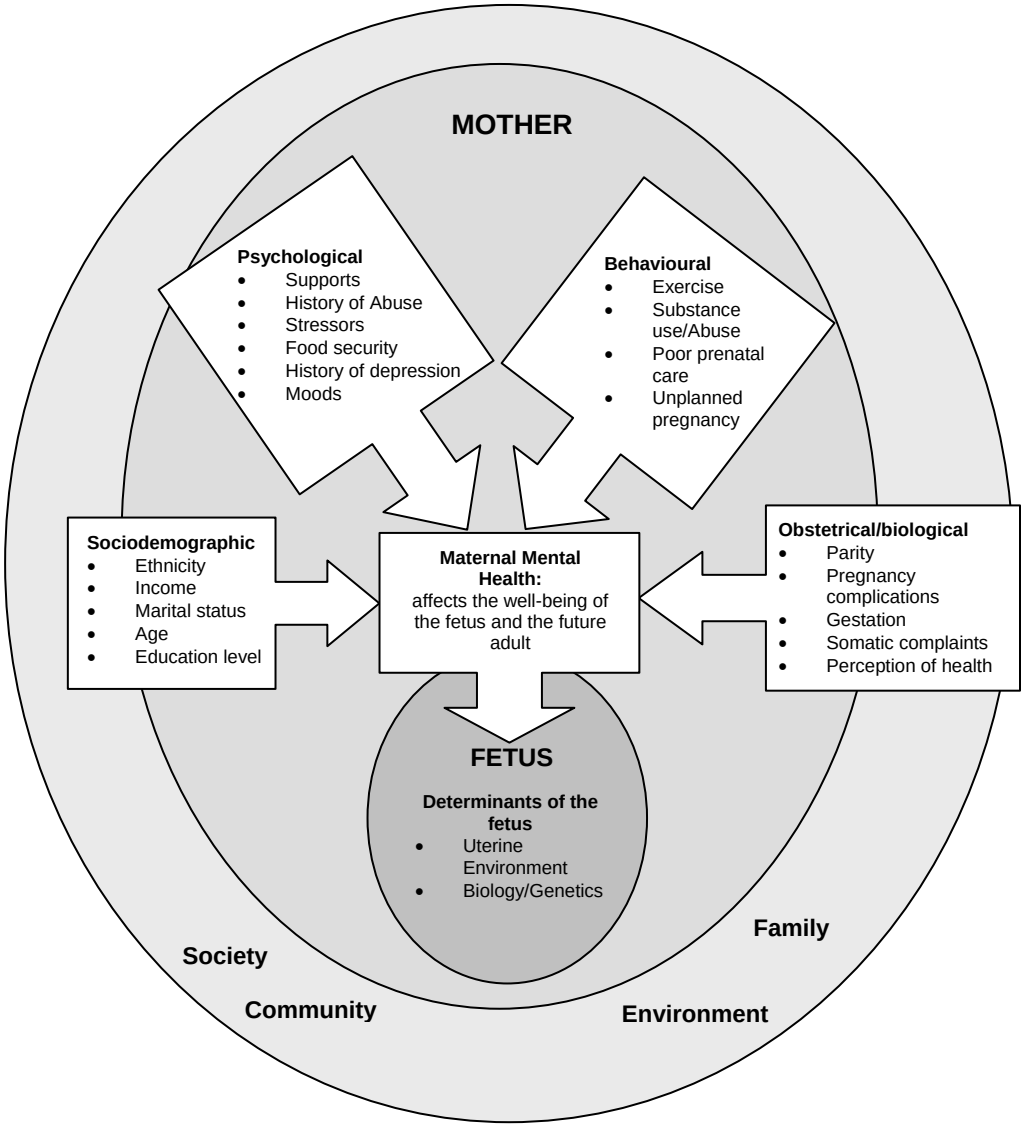
These determinants are affected by the mother's genetics/biology, life experiences, health history, and opportunities for healthy living. Some of these are at the individual level while others are at the community, family, society, and societal levels. For example, a single mother of three young children living in an inner-city neighbourhood may not have easy access to medical facilities, which may have a negative effect on her ability to get adequate prenatal care and decreases the chances for detecting problems such as anxiety and depression, and which may lead to less than optimal pregnancy outcomes. There is no routine assessment for depression in our region at this time. While these factors are important to the health of the mother and the fetus, they are not the focus of the research in this thesis; rather it focuses on the measurable determinants of antenatal depression at a more immediate level.

3.3 Summary

This thesis is guided by the perspective, premise, and hope that secondary prevention for women who are depressed in pregnancy will lead to early intervention on the mother, which will in turn exert primary prevention of disease, disability, and risk factors in the fetus, reducing effects of maternal depression of the child into adulthood. Using a population health approach to data collection and interpretation will lead to

increased knowledge about the prevalence and determinants associated with antenatal depression that will further our ability to promote levels of prevention through a more comprehensive approach to research of depression in pregnancy.

Figure 3.2 Determinants of antenatal depression and the fetus



CHAPTER 4

METHODOLOGY

This chapter describes the study design, the study population and sites, the preparation for the study, working within the health care system, staff training, recruitment, and inclusion and exclusion criteria. Then the chapter details data collection, questionnaire development, outcome variable, independent variables, sample size, and ethical considerations. Next, it describes the data preparation, methods for analysis of the data, and ends with the limitations of the study.

4.1 Study Design

This thesis included the first cross-sectional portion of a larger, longitudinal, epidemiological study of antenatal and postnatal depression in high-risk women in Saskatoon. The ongoing study was a cohort of 402 high-risk women who were interviewed in early pregnancy, again later in the pregnancy, and once after their babies were born. This cross-sectional portion was selected for this thesis due to the length of time before the final postpartum interview would have been completed and the implications for finishing the thesis.

4.2 Study Population

All study participants were clients of either the Healthy Mother Healthy Baby Program of the Saskatoon Health Region or the Westside Clinic of the Saskatoon Community Clinic in Saskatoon, Canada.

4.2.1 Healthy Mother Healthy Baby Program

The Healthy Mother Healthy Baby (HMHB) program of the Saskatoon Health Region began in 1983. It is a prenatal program designed to meet the needs of “hard to reach” pregnant women who are unlikely to engage in other prenatal services. It strives to promote optimal pregnancy outcomes and healthy lifestyle choices by providing support and education to approximately 500 women a year. While the program was originally intended for Aboriginal women, only 65% of women who attend now are either First

Nations or Métis. HMHB offers community-level interventions that focus on the social and financial stressors during pregnancy.

Service is provided in partnership with a variety of local programs such as Food for Thought (a cooking program that is part of the Canada Prenatal Nutrition Program), the Westside Clinic (discussed in detail in 4.2.2), *KidsFirst* (a program for addicted mothers within selected high-risk geographical areas of Saskatchewan), Healthy and Home (an early discharge program for new mothers), Saskatoon School Board (for women who are pregnant and attending school), Addiction Services (for women who are receiving services for addiction problems), the Salvation Army (a residential program, which is offered for pregnant teens and women who are unable to remain in their homes), Open Door Society (all new immigrants who are pregnant are offered an assessment with HMHB), and Social Services (the majority of women in HMHB are presently on social service assistance).[146]

Prenatal Outreach Workers, Maternal Child Registered Nurses, and a Nutritionist function as a team to provide individualized counselling in a home visit, outreach program. Interventions focus on alleviating adverse issues related to low-income status, poor nutrition, and unstable relationships and living situations, as well as reducing or eliminating alcohol, tobacco, and other substance abuse. Clients receive free prenatal vitamins, iron, Lactaid, milk coupons, and assistance with transportation to medical visits and prenatal classes. The program provides a variety of prenatal classes, such as single parent classes, expert information (e.g., legal), and special hospital tours for immigrant women. HMHB also offers a "Collegiate Program", which offers service to all pregnant women who are attending high-school or educational upgrade programs in Saskatoon.[146]

The majority of women call HMHB directly on the recommendation of friends or family members, although some are referred by other caregivers. Women are followed throughout pregnancy through home or school visits. Every client gets at least one postpartum visit by a nurse in the first few weeks after the baby is born. Women with ongoing needs are referred to other community agencies before being discharged from the program.[146]

The program uses broad risk categories to define eligibility for participation in HMHB. Following assessment by the nurse, the woman may be categorized as "low,

medium, or high risk" and is invited to participate in HMHB if she meets one of the following three risk categories:

- Low risk: Women with a need for information about pregnancy, nutrition, or with financial problems. They do not exhibit harmful lifestyle behaviours.
- Medium risk: Women who have recently decreased or quit harmful lifestyle behaviours such as tobacco or drug use. The woman is at risk for resuming the harmful behaviours under stress.
- High-risk: These are women with multiple stressors and who continue to participate in harmful lifestyle behaviours despite having received education about their effects on the fetus.

Women who do not meet these risk categories or who meet them but do not wish to participate in HMHB are directed to their physician, to prenatal classes, or to other organizations to get the assistance that they require.[147]

4.2.2 Westside Clinic

The Westside Clinic (WC) is part of the Saskatoon Community Clinic. The Saskatoon Community Clinic is a health care co-operative founded in 1962. As an organization, they are concerned with:

- the effects of poverty on health
- support for publicly-funded health care
- advocacy for the community clinic model of primary health care
- environmental issues
- support for programs to improve the lives of people who are not the greatest risk, including children, youth, Aboriginals, disabled persons, and seniors.[148]

WC is a separate store-front clinic situated in an inner-city area of Saskatoon. This location is convenient for women to drop-in or for ease of access by public transit. They do not have a policy that defines risk per se: rather all the clients they attract frequently experience socioeconomic stressors and addiction problems that put their health and the health of their baby at risk. WC provides medical care and psychosocial support to 60-80 pregnant women a year. All women who attend the WC are encouraged to participate in the HMHB program, but some women are struggling with addiction and other social problems that put them at very high risk and often they choose not to engage in any formal programming. WC offers prenatal clinics, which are open every Thursday afternoon for women to drop-in and ease their access to care.[148]

4.3 Preparation for the Study

4.3.1 Pilot study

Pilot studies are used to develop and test study tools and procedures and produce preliminary data.[149] Pilot studies can convince funding agencies that the main study is feasible and worth funding, and engage stakeholders in support of the study.[149] A pilot study of this project was conducted within HMHB in March and April of 2004. The findings were published in the *Journal of Obstetrics, Gynecology, and Neonatal Nursing* in July 2006.[82]

4.3.2 Working within the health care system

Once we determined that this study would take place, we formed an Antenatal Depression Advisory Group. This group consisted of administrators, educators, and clinicians involved in mental health, primary care, and women's health within the health region, including HMHB and WC. The group met every few months before the pilot study and throughout the study. A flow chart of available resources and the referral process was developed by the student and refined by the group (Appendix B). Mental Health Services within the health region agreed to provide immediate support and up to three counselling sessions to the women identified who screened positive for potential depression in the study. The WC had the resources to provide the support, counselling, and medical treatment to their clients who screened positive for depression in the study.

The Obstetrical Operations Committee for the Saskatoon Health Region was given overview of the study. Family physicians in the region were made aware of the goals and the commencement of the study at their monthly city-wide meeting in October 2004. They were also shown a copy of the referral form that they would receive if their client screened positively for depressive symptoms during the study so that they could further investigate and start any treatment that may be necessary. This form would be sent to the family physician of a woman who screened positive for depression with her permission (Appendix C). Women who were clients of WC were assessed by practitioners at that clinic.

The HMHB staff wanted to have information about depression and other feelings encountered by pregnant women to give to their clients. A booklet about "Feelings in Pregnancy and Motherhood" was developed for the women and their families. The staff

edited and approved the content and the style of the booklet. It was available for all potential participants whether they choose to join the study or not (Appendix D).

4.4 Recruitment

Recruitment commenced in October of 2004 and continued to August 2006. At HMHB, the nurse introduced the purpose of the study: "to improve our understanding of feelings during pregnancy and motherhood" and described the commitment needed by the woman for participation in the larger study. This included an interview to complete two short questionnaires on three different occasions. Women attending the WC were similarly recruited by the nurse in charge during visits at the prenatal clinic regularly held on Thursday afternoons.

4.4.1 Inclusion and exclusion criteria

All participants of HMHB or WC who spoke English were invited to participate in the study. Originally, only women under 20 weeks gestation were recruited to allow for the two data collection times during pregnancy. The average gestation of women in the pilot study was 17 weeks, with women at various stages in their pregnancy, and not necessarily at their first visit, and we were able to recruit 78% of those women. Therefore, recruiting women less than 20 weeks seemed feasible; however, within a few months of starting this larger study, both sites reported that many women were being excluded from the study because they were beyond this cut-off gestation period. Research has shown that women who are depressed present for prenatal care later in their pregnancies.[10] Therefore, to ensure that the data represented the most accurate reflection of this group of women, the criterion was changed to include all women at their first prenatal visit, no matter what their gestation was at the time of the first visit.

4.5 Data Collection

Staff at HMHB had participated in other research studies. In their experience, women in the program and their partners were becoming increasingly suspicious of strangers coming into their homes to collect information. This was especially true when the information was of a personal nature such as the extent of working outside the home, family violence, substance abuse, or any issues that may be reported to authorities, and which could lead to problems with social services such as apprehension of the baby.

Consequently, the manager and staff believed that they would be more successful in recruitment and data gathering than outside researchers would be.

The same philosophy about data collection for research purposes exists at the WC. I offered to be present to collect the data at each of the regular weekly prenatal clinics, but this was declined by WC. Instead, like HMHB, they chose to recruit and to collect the data themselves. There was no remuneration for either site for data collection or to the women for their participation in the study. Therefore, data collection was integrated into the regular work of the staff of HMHB and the WC, with the study questions and tools kept to a minimum.

In the eight months preceding the commencement of the study, I met with the staff at both sites, to incorporate study questions into the intake tools and procedures. The staff at HMHB had participated in the Pilot Study and had received some training in how to administer and score the depression screen tool.

To prepare for this study, a four-hour in-service was developed and presented to all staff both by myself and by a nurse therapist who specializes in the anxiety and mood disorders, particularly postpartum depression. The in-service included information about the signs and symptoms, aetiology, effects, and treatment of antenatal depression, and how to manage client issues that may arise from any of the items on the study tools e.g., identification of self-harm thoughts. It also incorporated instruction on the origins, administration, and scoring of the depression screen used in the study. The specifics of the study were discussed and a study protocol was developed to assist staff in data collection (Appendix E). The protocol was subsequently changed to include all women at their first visit, once the study was underway. I attended staff meetings, visited both offices, and kept in touch via telephone and email contact throughout the study.

4.5.1 Questionnaire development

The intake and discharge databases used by HMHB were extensively revised with the staff between May 2004 and September 2004. Questions for use in the study were incorporated as much as possible into existing documents and were tested with staff and clients over six months. Some questions about exercise, alcohol, tobacco, and drug use, which were not of interest to the program, were put on a supplemental sheet for study purposes (Appendix F).

WC staff used the provincial prenatal form as their only data collection tool for pregnant women. To standardize data collection between the two programs, items from the HMHB intake database required for the study were put on separate sheets for the women attending the WC (Appendix G).

Some items on the questionnaire were single item questions; this was done to facilitate data collection during routine visits with clients, many of whom may not have completed high-school. The questions were tested and retested with clients by the staff and the researcher and appeared to have face validity.[150] To improve the reliability of these questions for analysis, new variables were created by summing those items that were thought to measure a specific construct. These new variables (i.e., support, stressors) were tested for how well they measured the particular construct using the Cronbach's alpha coefficient. The generally agreed limit for the Cronbach's alpha coefficient is 0.70, with a lower limit of 0.60 for preliminary steps in research.[151]

4.5.2 Outcome variable

The outcome variable or variable of interest for this study was depression in pregnancy. The most commonly used screening tools for depression in the general population include the Beck Depression Inventory (BDI), Brief Symptom Inventory (BSI), Centre for Epidemiological Studies - Depression (CES-D) scale, and Research Diagnostic Criteria (RDC).[72] The Edinburgh Postnatal Depression Scale (EPDS)[50] is a tool developed in 1987 to screen for depression in postnatal women but was validated for use in pregnant women shortly after.[152] The EPDS is different from depression tools used in other populations as it removes the physical symptoms of depression associated with pregnancy and postpartum.[50]

The EPDS is the most widely used and translated screening tool for depression in childbearing worldwide.[43] Validation studies show that the EPDS has very good psychometric properties when compared to the most commonly used depression screening tools such as the Research Diagnostic Criteria (RDC), the Beck Depression Inventory (BDI) or the Center for Epidemiologic Studies Depression Scale (CES-D). Appendix H summarizes some of the validation studies and psychometric properties of the EPDS; as it shows, the sensitivity ranges from 73 to 100%, specificity from 68 to 96%, and the positive predictive value 56 to 73% in antenatal and postpartum women.[43,

[72, 153)] The EPDS was validated against the SCID (Structured Clinical Interview for DSM-IV Axis I disorders) in 110 Saskatchewan Aboriginal postpartum women in 2004 and was shown to have very good sensitivity (94%) and specificity (86%).[(154)]

The EPDS was chosen for this study because of its ease of use, extensive validation, non-commercial availability, feedback from the pilot study, and the desire of the participating organizations for an ongoing process for screening following participation in the study. The EPDS is meant to be self-administered. It includes 10 items with a Likert scale of responses scored from 0-3, to a maximum score of 30. The EPDS is available non-commercially. As the title of the EPDS contains the term "depression", to avoid any potential bias of the woman's responses it was renamed "Feelings in Pregnancy and Motherhood" for use in this study (Appendix I). The tool takes less than 10 minutes to complete and score (Appendix J).

The EPDS has come under criticism for its sole reliance on self-reported items to detect depression rather than using the tool in conjunction with clinical interviews.[(20)] This is a valid criticism, but one that is equally applicable to other tools commonly used in large epidemiological studies that rely on self-reported items for measuring depression.

The EPDS may not measure a single expression of mood or depression. A depression subscale (items 1, 2, and 8) and an anxiety subscale (items 3, 4, 5) have been identified in the EPDS in women in pregnant and postpartum women.[(155), (156)] The validity of the EPDS as a tool to identify anxiety was affirmed by Stuart et al. who found a strong correlation between the State Anxiety Scale of the State-Trait Anxiety Inventory and the EPDS ($r = .73$ at 14 weeks postpartum, $r = .82$ at 30 weeks postpartum, $n=107$).[(157)] Brouwers et al. also tested the validity of the EPDS for measuring anxiety and depression,[(155)] and they confirmed the presence and validity of the subscales but found the overall EPDS most accurately measured both depression and anxiety.

A single item, number 10, on the EPDS asks about thoughts of self-harm. Some people have questioned the reliability of the single item self-harm question in the EPDS to accurately detect suicide rather than other self-harm activities such as cutting or anorexia; however, Levey et al. compared sensitivity of the EPDS, Beck Depression Inventory, and the Hamilton Rating Scale for Depression and found that the EPDS was the most sensitive of the three for detecting suicidal thoughts.[(81)]

An EPDS score of 10 or more (≥10) represents minor depression[158, 159] and a cut-off score of 13 or more (≥13) has been validated and recommended for detecting major depression in pregnancy[152] and is used most often to report the prevalence of major depression in antenatal and postpartum women in the literature.[6, 67] Thus, a score of ≥13 was used to determine and report the prevalence of major depression in this study. All women who score at or above this cut-off were offered a referral to their physician for further assessment or to community agencies for supportive services (Appendix C). Therefore, it was essential to decrease the potential of women falsely screened as depressed. A higher cut-off may reduce possible overload on the health system, but it must be acknowledged that some women with depression may be missed through this process. Consequently, if staff were concerned about any aspect of the woman's mental health they were encouraged to use their professional judgment and refer clients for medical assessment beyond the criteria established in the screening process, particularly those women who may have responded positively to the question about self-harm thoughts.

In the analysis for this study, the EPDS was used as a continuous variable. It was also dichotomized into two separate derived variables: a) EPDS scores of greater or equal to 10 were used for identifying minor depression and b) EPDS scores of greater or equal to 13 for major depression.

4.5.3 Independent variables: Determinants of antenatal depression

4.5.3.1 Sociodemographic determinants

Age: Research confirms a relationship between younger age and increased risk for depression, especially for those still living with their parents.[13] Johanson et al. studied 417 women aged 15-41 (mean 24.6 years, SD 5), and they found a significant relationship between young age and depression in the postpartum but not in the antenatal women.[13] Age (years) was treated as both a continuous and a categorical variable (≤21 and >21) in the analysis.

Marital Status: Blazer reports that women who have never been married experience less depression than women who were separated, divorced, or widowed.[17] It is unknown how many of these women were pregnant or postpartum. However, lone parenthood has been associated with a two-fold increase in depression, and single status

has been linked with antenatal depression.[6, 7, 67, 160, 161] Hobfall identified single status as the only indicator of antenatal depression in his study of high-risk women.[12] Single mothers access mental health services more often, experience more economic and social disadvantage, and were twice as likely to have suffered depression in the past year as married women.[7, 162] Women were categorized as non-partnered for the purposes of this study if they were single, divorced, or widowed and partnered if they were married or in a common-law relationship.

Ethnicity: In two studies of antenatal depression in high-risk women, minority status (Black) was associated with depression.[6, 12] On the other hand, Da-Silva was unable to establish a relationship between ethnicity and depression in pregnancy.[6] The birth rate to Aboriginal women is approximately 2.7 per woman compared to 1.6 per woman in the entire population of women in Saskatchewan.[163]

Overall, Aboriginal people are at higher risk of depression.[1] This was confirmed by Muhajarine in 1994, who found that pregnant Aboriginal women were at double the risk for depression.[164] However, Beattie found similar rates of postpartum depression in Aboriginal women to non-Aboriginal women in the general population.[154] Given these differences in findings, it is important that future studies of depression in pregnancy also include a focus on Aboriginal women. Women who self-identified as First Nations or Métis were categorized as Aboriginal: all other women were identified as non-Aboriginal in this analysis.

Education: Low education, particularly not graduating from grade 12, has been associated with depressive symptoms in inner-city pregnant women.[67] Education level was collected as a categorical variable. It was dichotomized to represent those women who had or who had not completed Grade 12.

Income: Bolton et al., found poverty was the most important risk factor for the development of antenatal depression.[67] Low income has also been associated with postpartum depression.[165] Some authors believe that social selection or social drift (which occurs when people with mental health problems experience downward social mobility) is both an outcome and a predictor of low socioeconomic status[166, 167] and major depression.[17] Family income was assessed through five categories: under <$20,000 per year, $20,000 to $39,000 per year, $40,000-$60,000 per year, and >$60,000

per year, plus income assistance. This was dichotomized to <$20,000 and income assistance versus those earning over $20,000.

4.5.3.2 Obstetrical/biological determinants

Gestation: Preterm delivery (delivery at <37weeks gestation) has been associated with anxiety and depression in the mother.[91, 103, 168] Gestation (weeks) was recorded by staff or calculated from the expected due date and the date of the interview.

Gravida or total number of pregnancies: Antenatal depression has been associated with first pregnancies and deliveries[6, 161] but other researchers conclude that increased parity is a factor in the development of depression in pregnancy,[14, 67, 169] particularly in younger women.[169] The actual number of pregnancies was recorded and used as both a continuous and a categorical variable in the analysis.

Number of preterm pregnancies: Anxiety and depression in pregnancy have been associated with preterm delivery.[91, 168] The actual number of preterm deliveries was recorded and analyzed as a continuous and a categorical variable.

Number of abortions: Antenatal depression has been linked to history of previous abortions.[19, 58] The actual number of abortions was recorded and analyzed as both a continuous and a categorical variable.

Somatic and health complaints: Medical illness is highly associated with depression in the general population,[84] and particularly nausea and vomiting and headaches during pregnancy.[49] Data on somatic and health complaint items were recorded as text data. This includes nausea and vomiting and headaches. These were simple yes or no responses. Each case was manually checked for somatic or health complaints and then developed a new variable which represented the somatic complaints as a numerical sum. These responses were also categorized: 0 complaints, 1 complaint, 2 complaints, 3 complaints, and 4 or more complaints. Complaints of nausea and vomiting and headaches were treated as two separate dichotomous variables.

Overall health today: There is widespread agreement that the question of "How would you rate your overall health today?" provides a useful summary of all aspects of health status.[170, 171] This item was treated as a categorical variable (Excellent, Very Good, Good, Fair, and Poor), but it was also dichotomized into Good (including Excellent, Very Good, and Good) and Poor (including Fair and Poor).

4.5.3.3 Psychological determinants

Stressors: Life stress is associated with depression, especially in the antenatal period.[11, 172] Women were asked to put a √ (check mark) beside a list of specific sources of stress that they were presently experiencing. Potential responses included: Pregnancy, Partner, Money, Children, Family, Where I live, Health of my baby, Birth of my baby, Own health, Work, School, and Other stressor. The 12 items were summed into one composite variable by assigning 1 to each positive response to a stressor and 0 to the negative responses. The Cronbach's alpha on these 12 items was high: 0.998. A single question about legal problems was added to the stressor items, and the alpha coefficient remained high at 0.991, which indicates strong support the items to be treated as a summary variable.[151] This summed variable was also categorized into: lowest (0-1 stressors), middle (2-3 stressors), and highest ($\geq$4 stressors) numbers of stressors. This was determined by attempting to create categories of equal numbers of stressors. Each individual potential source of stress was also treated as a separate item in the analysis.

Food Security: In a telephone study of 7,000 adults in Saskatchewan, food security issues were associated with increased levels of depression.[173] Two questions taken from the National Population Health Survey[174] asked about whether the woman's family had enough food to eat or if she was worried that there would not be enough to eat because of a lack of money. Adding the food security items to the stressor scale increased the stressors to 15, decreased the Cronbach's alpha to 0.975, and there was similarity in the stressor items about money and the food security items, so food security and stressors were treated separately. The responses to these two items were summed and then categorized into the low (negative response to both food security questions), middle (a positive response to one of the questions), and high amounts (positive response to both questions) of food insecurity.

Support: Social support, especially from the partner, is perceived as essential to mental well-being in pregnancy.[67, 69, 161] This is particularly true for single mothers who may experience less contact with family and close friends.[7, 164] In a group of Australian women, lack of social support was associated with late prenatal care and depression, with women in the low support group twice as likely to have high levels of depression.[175]

Participants were asked whether they have someone from whom they received emotional support and, if so, the sources of that emotional support (partner, mother, friend, relative, or other), who gives them the most support, and if they can count on that person for support no matter what. The possible sources of support were added up to create a summary variable. The Cronbach's alpha coefficient for these items was 0.915. The variable was divided into four types by attempting to develop equal categories: no support (0 support), low support (1 support), medium support (2 supports), and high support (3 or more supports). The items were also treated as specific sources of support: partner, mother, friend, female relative, and other.

The responses to the questions about whether the woman was seeing a counsellor now or in the past were added to the summed support variable. The addition lessened the Cronbach's alpha coefficient and decreased the number of available cases for analysis so they were left off the summary support variable.

Relationship: Marital discord has been found to be a predisposing factor for PPD.[176] Therefore, women were asked: "Are you in a relationship now?" and "Are you satisfied with the relationship?" Fewer women answered this question than about their marital status and some women would check a negative response to the first part of the question (e.g., no relationship now) and then responded positively to the second part. Therefore, the question about marital status was used to represent the relationship status.

Abuse: Depression has been shown to be both a predictor and an outcome of family violence, particularly during pregnancy.[69, 177-181] In a study of family violence in 1,491 pregnant women, depression was highly correlated with abuse.[8] Yet, Morris-Rush et al. found no association between family violence and postpartum depression in a high-risk inner-city population.[165]

Participants were asked to respond either yes or no, if they had experienced specific acts of abuse against them: physical (hit, slap, restrained, punch, pinch, kick, beat you), emotional (yell, belittle, berate, blame, neglect), and sexual abuse (touched against their will, rape). These three items were combined into one summary variable of history of abuse. The Cronbach's alpha coefficient on these items was only 0.681. Given the loss in the Cronbach's value, they were used as separate categorical variables and not summed to one single variable.

History of depression: A history of depression is often associated with future depressive episodes, especially for postpartum depression,[182] but the research supporting a relationship between history of depression and antenatal depression is contradictory.[67, 161, 183] This variable consisted of self-reported questions about the woman's history of depression, and specifically antenatal and/or postnatal depression. An attempt was made to devise a summary variable measuring the construct "exposure to depression". While these questions had a Cronbach's Alpha greater than 0.7, including the history of antenatal and postnatal depression decreased the number of women available for other analyses: therefore, the history of depression variable was treated as a dichotomous item.

Moods up and down: Increased fluctuation in moods is seen in people who are depressed.[184] Women were asked a single question about whether or not their moods went up or down.

4.5.3.4 Behavioural determinants

Exercise: Exercise is associated with decreased depressive symptoms in the general population, in a dose-related amount.[185] Women were offered options about the frequency of exercise (e.g., 20 minutes of walking) in daily increments in the past week. The amount of exercise was used as a categorical variable: Every day, 2-3 times per week, occasionally, or never.

Smoking: Smoking negatively affects the well-being of the woman, the outcomes of the pregnancy, and the health of the fetus.[15, 186] In a study of smoking and depression in pregnant women, Zhu reported that 12.9% of the women who never smoked were depressed, 25% of former smokers were depressed, and 37.5% of the women who currently smoked were depressed.[77]

Participants were asked if they smoked, if they had ever smoked, the amount smoked per day in the last month, or if they had quit before or since becoming pregnant. Smoking was analyzed using these categories but was also recoded into three categories: never smoked, current smoking, or quit smoking (before or during pregnancy). The age at which smoking began was also asked.

Alcohol use: Alcohol use and depressive symptoms exacerbate each other.[187] Women who use alcohol have increased acuity of depressive symptoms and are more likely to relapse, and are more resistant to treatment and more likely to commit

suicide.[187] The amount of alcohol use in pregnancy varies widely. Muhajarine reported overall alcohol consumption at some time during pregnancy to be 46%,[164] however, in a study of 2,100 pregnant women in a primary care setting, Marcus noted 10% of pregnant used alcohol.[56]

Alcohol use was determined using questions that encompass the risk criteria for Fetal Alcohol Spectrum Disorder (FASD): i.e., drinking 5 or more drinks at one sitting (binge drinking), and drinking of 1- 2 drinks every day in the last month, or if they had quit using alcohol during or before pregnancy.[188] Women were also asked their age when they started drinking alcohol. Women could check (√) more than one category (e.g., occasional drink and binge drink). The variable was recoded into three categories of alcohol use: never used, current use, or quit use (before or during pregnancy).

Drug use: Illicit drug use has been associated with depressive symptoms, particularly in pregnant adolescents.[76, 189-191] Participants were asked how often they had used illicit drugs such as cocaine, crystal meth., and marijuana in the past month or if they had quit during or before pregnancy, and the age that drug use began. The variable was recoded into three categories: never used, current use, or quit use (before or during pregnancy).

Unplanned pregnancy: Unintentional pregnancy, when combined with low socioeconomic status or single status, appears to be significantly associated with depression.[78, 192-194] Women were asked if they had planned their pregnancy. This question had a yes or no choice for response but in the testing of the questions, women would often respond ‘sort of’, so this option was added and coded as a ‘yes’ for the analysis.

4.6 Sample Size

The sample size was calculated for the longitudinal study, which needed to account for potential attrition over the three data collection times. The sample size was calculated using the prevalence of depression, alcohol use, smoking, and drug use from the pilot study and other studies in high-risk women.[12, 82, 164] A sample size of 366 women would be adequate to determine an expected prevalence of depression of 27% and other behavioural determinants in a longitudinal study and a sample of 302 in the cross-sectional study, with power of 80%, and an expected 5% margin of error. Table 4.2 shows

estimated sample sizes required and the associated statistical power for each estimated sample size.

Table 4.2 Power and sample size considerations

Variable	Expected prevalence (%)	Margin of error (%)	Estimated sample size	Attrition 20%	Sample needed
Depression	27	5	302	64	366
Smoking	75	5	288	56	344
Alcohol	13	5	264	52	316
Drugs	18	5	254	50	304

4.7 Ethical Considerations

There may be concern about the potential for coercion of clients to participate when caregivers are involved in recruitment or data collection for research projects.[195] This would particularly be true for this group of vulnerable women who receive milk coupons and vitamins from the HMHB staff. The pilot study had a participation rate of 78%, which indicates that some women felt free to refuse to participate without fear of repercussion. Recognizing that many of the potential participants would not have completed high-school, the consent was kept to one page and made as simple as possible. The consent also included the phone numbers of resources the woman could call if she had any concerns about her mental health (Appendix K).[82]

It was anticipated that up to 30% of the participants could be less than 18 years of age. Accordingly, a Waiver for Parental Consent was developed to satisfy the requirements of the University Advisory Committee on Ethics in Behavioural Science, University of Saskatchewan (Appendix L).

Ethical approval was obtained from the University Advisory Committee on Ethics in Behavioural Science, University of Saskatchewan, on September 10, 2004 (Appendix M). Saskatoon Health Region approved the research study on September 23, 2004 (Appendix N). The Saskatoon Community Clinic gave verbal approval for the study in August of 2004.

4.8 The Data

Staff at both sites were concerned that some women who belong to both the HMHB program and who attend WC would complete the study questionnaires twice (within each program). To help avoid duplicate entries of data, each site kept a tally of

whether or not each woman in their program was or was not participating in the study. Women who participate in the HMHB program sign a consent stating their information may be shared with their family physician. Women who attend WC sign a consent agreeing for information to be exchanged with HMHB. To determine if there was doubling-up of participants at both sites, the secretaries from each program compared the WC list to see if women were participating at HMHB. Four women appeared to have completed the questionnaires at both sites; these women were included and coded in the study as WC clients.

Each participant was given a unique identifying number at their site, and each page of the questionnaire reflected this identifying number and the site location. A new distinctive number was given within the study.

4.8.1 Data entry

Initially the data were entered into the Statistical Package for the Social Sciences (SPSS) 11.0 by the secretaries at HMHB and WC. These data were merged for analysis and the data entry was completed by me and two research assistants using SPSS 14.0. A supplemental form was developed for WC to transfer data from the Prenatal Sheet and birth record supplied by the hospital to the clinic (Appendix O). The intake sheets were photocopied by the secretary at HMHB and any identifying information was blackened out. Only the identifying number appeared on the data that was received for analysis.

4.8.2 Data preparation

Data were prepared for analysis using the process as outlined by Tabachnick and Fidell and Hair et al.[151, 196] First, data were double-checked against the original intake and data collection sheets for accuracy and erroneous entry; this data cleaning was done by two research assistants and me. Next, the data were assessed using descriptive statistics in SPSS for those data out of the possible range. If numbers did exist outside the range, the data were retrieved from the original sheets and corrected where possible or left as missing.

The data were checked for missing values. As expected in this high-risk group of women, some variables had missing data. When missing values were found in continuous variables (e.g., age, EPDS), the missing values were imputed with the group mean to create a new variable. While this is the simplest option, it can lower the variability, which

in turn can bias results towards the null.[151] The variable with the imputed data were compared to the variable with the missing values using T-tests and Crosstabs. There were no statistical differences between the mean values of the variables with missing values and those with imputed values.

Composite variables (e.g., stressors and support) were derived by summing items and using the Cronbach's alpha coefficient to see how well the factors of the EPDS measured a single construct.[151] The variables were checked for normality, kurtosis, and skewness. To facilitate reporting and interpretation of the data, no transformations were done to any of the variables.

4.9. Approach to Analysis

The method of analysis is reported by each research question to address the hypothesis outlined in Section 1.2.

4.9.1 Question 1. What is the prevalence of antenatal depression in this sample of high-risk women and is this prevalence different from rates reported in the literature for comparable groups?

Analysis: Following data preparation, descriptive statistics including, means, mode, median, standard deviations, and frequencies were assessed on each variable. The prevalence, incidence, and the 95% confidence intervals for major depression and minor depression were determined. Data between the two sites and participant and non-participants were compared for differences by using Crosstabs or T-tests where appropriate. Post hoc analysis was done by logistic regression on the categories of the significant variables. A thorough review of the literature was done for comparison.

4.9.2 Question 2. What sociodemographic, biological/obstetrical, psychological, and behavioural determinants are associated with antenatal depression in this group of high-risk women?

Analysis: Descriptive and bivariate analyses were performed on each determinant. Chi-Square and T-tests were used to establish the associations between the dependent variable, EPDS (<13 or ≥ 13), and the various sociodemographic, biological/obstetrical, psychological, and behavioural determinants.

Determinants, which had bivariate associations at p-value significance <0.25 were then entered into a logistic regression procedure to determine the final model for antenatal

depression in each of the determinants (sociodemographic, biological/obstetrical, psychological, and behavioural).[197] However, in the analysis for the final model, including all of the variables within each health determinant, using a significance level of <0.25, would have resulted in a large number of variables, greater than the 15-20 that are recommended.[151] Therefore, for the analysis of the final model, only those variables with a bivariate association significant at <0.10 were entered stepwise into the final logistic regression.

The variables in each model within the sociodemographic, obstetrical/biological, psychological, and behavioural determinants and the final model for antenatal depression were tested for interaction. When there was no interaction present, the crude and adjusted odds ratio of determinants in the models were compared for potential confounding, and a 10% difference was used to determine the presence of confounding.

4.9.3 Question 3. What are the prevalence and determinants of antenatal depression in Aboriginal women compared to non-Aboriginal women, women 21 and under compared to women 21 and over, and non-partnered women compared to partnered women?

Analysis: Similar analyses were done as in Question 2 for the different groups of women.

4.9.4 Question 4. Does the Edinburgh Postnatal Depression Scale develop into constituent measures of depression, how do they contribute to the overall score, and what are the determinants associated with these constituent measures in this sample of high-risk women?

Analysis: The mean was determined for each item of the EPDS. An exploratory factor analysis was performed to determine the different factors underlying the EPDS, without any prior restrictions on the number of factors.[151] A Varimax rotation was used to maximize the loadings of the factors.[151] Subscales were created by summing the individual items identified in the Factor Analysis. The Cronbach's alpha coefficient was used to determine the internal consistency reliability of the factors of the EPDS in its entirety and in the subscales.[151, 198]

Linear regression was used to determine the associations between the determinants ($p<0.25$) and the anxiety, depression, and self-harm subscales in all women,

as well as in the Aboriginal and non-Aboriginal women, the partnered and non-partnered women, and the women over and under 21 years of age.

4.9.5 Question 5. Are the constituent measures on the Edinburgh Postnatal Scale different for the subgroups of women (e.g., younger, Aboriginal, non-partnered)?

Analysis: T-tests and the Mann-Whitney U-test were performed on the subscales to determine the differences between each of the two groups of women. The Cronbach's alpha coefficient was performed on the subscales within the different groups of women to determine if the items retained their internal consistency in the different groups.

4.10 Limitations

The main limitations in this study focus on the nature of the participants, measures used, and cross-sectional study design.

4.10.1 Participants

The participants were voluntary clients of either the Healthy Mother Healthy Baby program or the Westside Clinic in Saskatoon. These women were considered high-risk in their life circumstance and behaviours, but it is accepted that the very high-risk women may not receive obstetrical care or participate in any prenatal programs, so they may not be represented in this data. Therefore, the results of this study are not generalizable to all pregnant women or all high-risk pregnant women. However, the findings may be of interest to other communities with pregnant women of similar risk or sociodemographic profiles, particularly in the prairie provinces and in the northern communities.

It is acknowledged that people who participate in research related to psychiatric research are more likely to meet the criteria for mental disorders.[199, 200] On the other hand, severely depressed women may be too ill to want or be able to participate in a study.

Women provided information to caregivers. This may have influenced their responses to the questions related to smoking, alcohol and drug use, income, and family violence. Pregnant women have been found to underestimate factors associated with their health history and data collected may be susceptible to recall bias.[201]

Only English speaking participants were recruited into the study. However, 10% of the women who attend HMHB are new immigrants. The literature suggests that new immigrants to Canada have a lower rate of depression.[202] The EPDS is available for use

in a variety of languages and dialects, but the rest of the questions used in the study were only available in English. The program often uses translators, but staff said that the sensitive nature of some of the questions (abuse, depression) would make it difficult to ensure an accurate response from participants, so women who could not understand the EPDS or the questionnaires in English were not included.

4.10.2 Study tools

The Edinburgh Postnatal Depression Scale has been repeatedly validated in different settings and cultures, including Saskatchewan urban Aboriginal women.[43, 154] However, the EPDS was not validated in this particular population.

The questionnaire used in the study was primarily for intake into the HMHB. It would have been ideal to have a number of validated scales for different determinants. For example tools that would screen for problem drinking (e.g., TWEAK or T-ACE),[203] or a support questionnaire (e.g., Maternity Social Support Scale),[175] or an anxiety scale (e.g., STAI-State-Trait Anxiety Inventory),[204] or an abuse screen (e.g., WAST - Woman Abuse Screening Tool)[205], would have given more in-depth information, but adding more questions was not feasible.

There were no clinical interviews to confirm the diagnosis of depression in individual participants. Women at HMHB were referred to their family physician for further assessment, diagnosis, and possible treatment; however, there are over 60 different physicians potentially involved in the care of this large number of women. Each doctor has their own unique practice styles and diagnosis criteria for diagnosis and treatment of depression. It was not possible within the constraints of this study to follow each participant out of the HMHB program to their personal physician. WC assessed and treated their own clients, but each practitioner uses individual approaches to diagnose and treat depression in their clients.

4.10.3 Study design

Cross-sectional studies are a type of observational study that are effective for determining the prevalence of disease in the total group and different subgroups and the association between variables, but the lack of a temporal relationship (other than recall) confines the ability to establish a causal relationship between the exposure and the onset of disease.[139]

A final, but important limitation was that data were primarily collected as part of intake to the respective programs rather than for a research study. Staff and management identified early on that collecting the data within the context of their regular job would be the best approach to data collection with such vulnerable and difficult to reach women. It became evident early in the study that there were competing interests between the clinical intake objectives of the study sites and data collection for the study. Staff illness, prolonged absences, and the eventual resignation of the program manager, as well as the relocation of the program to a new site, meant that there was less staff time available to do the additional work needed to introduce the study, get informed consent, administer, and score the EPDS, and collect the additional data on behaviours. Consequently, women who were eligible to be participants were not always recruited to the study, which may have lessened the prevalence and changed the associations in the bivariate analysis and logistic regression analysis.

Staff collecting the data may have also led to errors in data collection and an increased susceptibility for information bias, particularly nondifferential misclassification.[139] Nondifferential misclassification occurs when there is a problem with data collection and classification of either cases or controls to the wrong category. The effect is to dilute or lessen the odds ratio towards 1.0 and decrease the likelihood of detecting an association if one exists.[139]

4.11 Summary

This study collected data about depression and determinants of depression in a high-risk socially vulnerable sample of pregnant women attending prenatal programs in Saskatoon. Study design and data collection was limited by the nature of the clients and the competing interests of the data collection sites. However, a large sample of women did participate in the study and they provided ample data for analysis.

CHAPTER 5

RESULTS

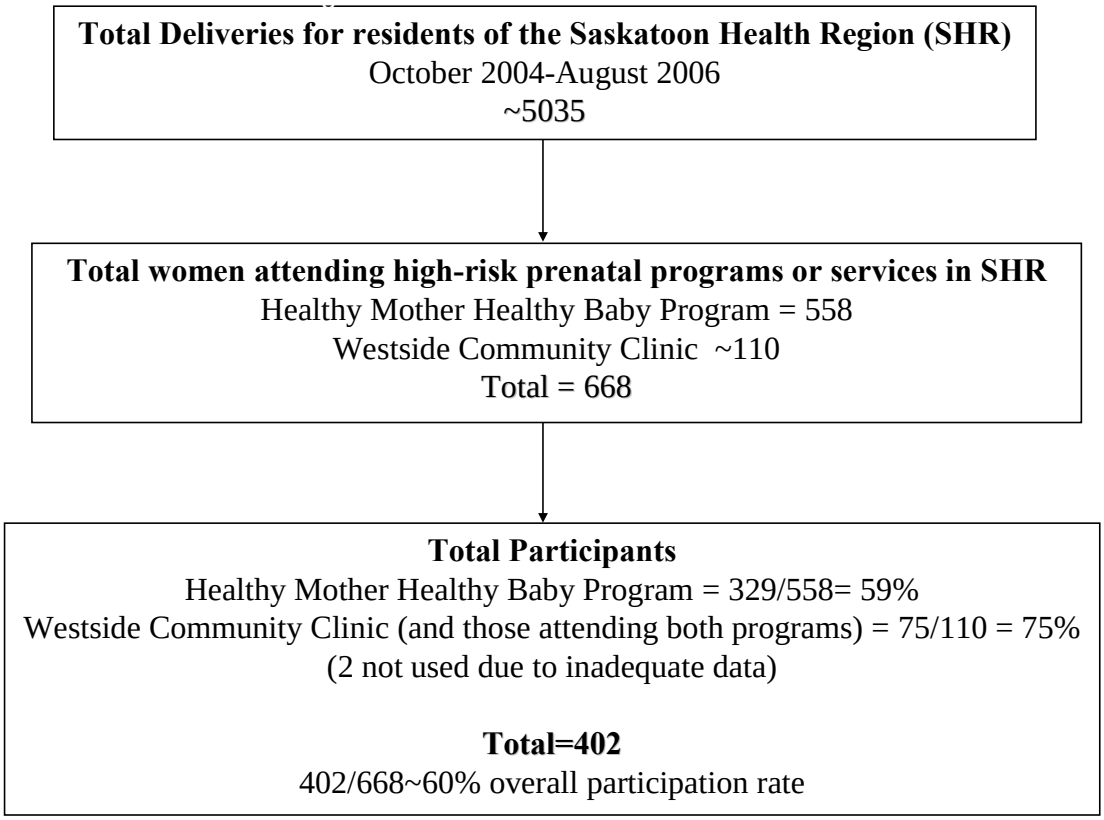
This chapter presents a description of the study participants and the sociodemographic, biological/obstetrical, psychosocial, and behavioural determinants associated with antenatal depression. Part One profiles the characteristics of the women in the study. It contains a comparison of sociodemographic variables between clients from the two sites: HMHB program and the WC. Limited data was also available from 83 HMHB non-participants. Data from this group was compared to participants from the HMHB program. Unless otherwise indicated, a significance level of $p<0.05$ was used to determine statistical significance. Part Two addresses the questions posed in the thesis; it presents the prevalence, incidence, comparative, and analytic findings for the data.

PART ONE

5.1 Characteristics of the Participants

As Figure 5.1 depicts, approximately 668 women from both study sites would have met the eligibility criteria and would have been potential participants during the study period.

Figure 5.1 Study sample



Data were collected and available for analysis for 402 women from the two sites. Some data were missing on individual women, but for inclusion in the analysis, the EPDS had to be completed. The sociodemographic, obstetrical/biological, psychological, and behavioural determinants are provided in detail in Tables 5.1 to 5.6.

As Table 5.1 shows, the majority of women in this group were young (mean age 22.8 $\pm$ 5.2 years), non-partnered (56.6%), 63.7% have not graduated from high-school, 85% were on social assistance or living on less than $20,000 a year, and two-thirds were of Aboriginal or Métis ancestry. Less than 4% live in a home that they own and more than 50% were planning to move. The numbers in each category may not total to 402, as there may be missing data for some of the items.

Table 5.1 Sociodemographic characteristics (n=402)*

	n*	%
Age (years)		
<20	125	31.1
20-24	161	40
25-29	61	15.2
30-34	43	10.7
35-39	11	2.7
≥40	1	0.2
Marital Status		
Single	205	54.0
Common Law	126	33.5
Married	37	9.8
Separated/divorced/widowed	10	2.7
Ethnicity		
Aboriginal-Status	193	49.5
Aboriginal-Non Status	18	4.6
Métis	44	11.3
Caucasian	114	29.2
Immigrant	14	3.6
Other	7	1.8
Education		
<Grade 8	19	4.9
Grade 9-12	228	58.6
Completed grade 12	76	19.5
Some post secondary	41	10.5
Completed post secondary	24	6.2
Income		
Income Assistance	213	56.5
<$20,000	108	28.6
20,000-39,000	32	8.5
40,000-59,000	6	1.6
>60,000	1	0.3
Other	17	4.5

* Totals do not always equal to 402 due to missing data

Table 5.2 describes the obstetrical and biological determinants of the women. The average gestation of the pregnancy at the time of the assessment was 15.2 weeks (± 6.5 weeks), with a range 4.5-35 weeks. Sixty percent of the women have already had one pregnancy, and the average number of pregnancies per woman was 2.6 ± 2.03. Twenty-five percent of the women have experienced an abortion, but it was not known if these were induced or spontaneous. Most of the women reported their overall health as excellent, very good, or good (82.0%). Twenty percent of the women reported nausea and vomiting.

Table 5.2 Obstetrical/biological determinants

		n	%
Total number of pregnancies			
	1	160	39.5
	2	91	22.7
	3	52	13.0
	4	34	8.7
	5+	65	16.1
Number of pregnancies to term			
	0	235	58.6
	1	72	18.0
	2	43	10.7
	3	31	7.7
	4+	20	4.9
Number of preterm pregnancies			
	0	384	95.8
	1	17	4.2
Number of abortions			
	0	296	73.8
	1	61	15.2
	2	26	6.5
	3	11	2.7
	4	7	1.7
Number of living children			
	0	190	47.4
	1	91	22.7
	2	51	12.7
	3	39	9.7
	4	16	4.0
	5+	14	3.3
Total number of somatic and health complaints			
	0	88	21.4
	1	93	23.1
	2	83	20.9
	3	68	16.9
	4+	72	17.9
Nausea & Vomiting			
Yes		81	20.5
Headaches			
Yes		53	13.2
Overall health today			
Excellent		31	8.5
Very good		104	28.4
Good		165	45.1
Fair		48	13.1
Poor		18	4.9

The cumulative stress score was an average of 2.26 $\pm$ 1.79 stressors. As Table 5.3 shows, most of the women experienced medium (2-3 stressors) to high levels of stressors

(4+ stressors). Almost 40% report money as a stressor. Over 30% report high food security problems. Almost half of women report low levels of support: the cumulative support score was 1.66 $\pm$ 0.87 supports. Of the 43.4% of women who said they were married or in a common-law relationship, 64% reported their partner as a source of support, and 46.9% stated that their partner gave them the most support. For non-partnered women, 31.6% received the most support from their mother. Over 90% of the women stated that they were able to count on the person who supported them the most no matter what happened to them.

Fifty percent of the women had a history of physical abuse, 56% reported emotional abuse, and 36.6% reported sexual abuse. Forty-three percent of the women had a history of depression. Fifteen percent of participants reported that their mothers experienced a depression during or after pregnancy; however, 63% of women either did not respond or did not know about their mother's obstetrical depression history. Of the women who have been pregnant before, 24.9% have experienced antenatal depression and 33.8% had postpartum depression.

Table 5.3 Psychological determinants

		n	%
Stressor score			
Lowest (0-1stressors)		161	40.0
Middle (2-3 stressors)		135	33.6
Highest (4+ stressors)		106	26.4
Specific sources of stress			
No stressors right now		64	16.3
Pregnancy		63	16.0
Partner		108	27.5
Money		157	39.9
Children		58	14.5
Family		78	19.8
Where I live		64	16.3
Health of my baby		59	15.0
Birth of my baby		39	9.9
Own health		34	8.7
Work		42	10.7
School		55	14.0
Other		112	28.6
Food Security			
Not have enough food to eat?	Yes	120	34.7
Worry that there would not be enough to eat because of a lack of money?	Yes	149	44.1

Table 5.3 Psychological determinants

	n	%
Food security		
Lowest (negative response to both questions)	176	52.5
Middle (positive response to one question)	55	16.4
Highest (positive response to both questions)	104	31.0
Support score		
No support	19	4.8
Low (1 support)	169	43.0
Medium (2 support)	143	36.4
High (3+ supports)	62	15.8
Specific sources of support		
Support in general	376	94.5
partner	177	44.5
mother	168	42.3
friend	124	31.2
female relative	111	27.5
other (father, mother-in-law etc.)	81	20.5
Who gives most support? (# or % of positive response to each item)		
Partner	103	25.6
Mother	95	26.1
Friend	38	10.4
Female relative	56	15.4
Other and combination of above	56	15.4
Can you count on that person no matter what?		
Yes	328	91.9
Have you had counselling in past?		
Yes	232	60.7
Are you in counselling now?		
Yes	63	16.7
Are you in a relationship now?		
Yes	284	75.8
Are you satisfied with the relationship?		
Very satisfied	169	65.3
Somewhat satisfied	77	29.7
Not satisfied	13	5.0
Have you been physically abused?		
Yes	187	49.9
Have you been emotionally abused?		
Yes	210	56.1
Have you been sexually abused?		
Yes	136	36.6
History of depression		
Yes	167	43.5
In women who have had a pregnancy,		
Previous antenatal depression	50	24.9
Previous postnatal depression	70	33.8
Do your moods go up and down		
Yes	185	50.7
Legal Problems		
Yes	75	19.9

Table 5.4 describes the behavioural determinants of health. Ninety percent of the women reported some level of physical activity. Fifty-five percent of the women reported smoking in the current pregnancy and 30% reported that they had quit either before or during the pregnancy. The number of women who stated that they presently use alcohol was 10.9%. However, women checked off (√) more than one category, as they were able to do (e.g., Occasional drink and 5+ drinks at one time), to try to capture different patterns of drinking-the woman who might occasionally drink but also have binge episodes that would potentially contribute to problems for the fetus such as Fetal Alcohol disorder. Some women reported that they were drinking a certain amount but also that they had quit, when this was the case, the women were categorized as having quit using alcohol.

Women reported using drugs more often that alcohol (18.5% versus 10.9%). The average age of starting smoking was 13.4 $\pm$ 2.9 years, with alcohol use starting at age 14.7 $\pm$ 2.7 years, and drug use beginning at age 15.1 $\pm$ 3.2 years. The age of starting tobacco, alcohol, or drug use was not associated with depressive symptoms.

Table 5.4 Behavioural determinants

	n	%
Exercise		
Every day	128	32.6
2-3 times a week	95	24.2
Occasional	131	33.3
Never	39	9.9
Smoking		
<5 a day	112	28.7
5-20	101	25.4
>20	4	1.0
Quit since pregnant	69	17.6
Quit before pregnant	50	12.6
I never smoked	61	15.4
Smoking		
Never smoked	61	15.4
Quit smoking before or during pregnancy	119	30.1
Current smoker	216	54.5
Alcohol use		
Current drinker	44	10.9
Never drank alcohol	55	13.7
Quit before or during pregnancy	303	75.4

Table 5.4 Behavioural determinants

	n	%
Drug use		
Regular, daily	32	8.2
Occasionally	40	10.3
Quit since pregnant	101	25.9
Quit before pregnant	86	22.1
I never used such drugs	131	33.6
Drug use		
Never used drugs	131	33.6
Quit drug use before or during pregnancy	187	48.0
Current drug use	72	18.5
Unplanned pregnancy		
Yes	282	72.1
Vitamin use		
Yes	265	82.6

5.2 Comparison of the Two Sites: HMHB and WC

Data were collected from two sites, HMHB and WC. Table 5.5 depicts the significant differences between the sociodemographic, obstetrical/biological, psychological, and behavioural determinants of antenatal depression between the two sites. Significantly more of the women from the WC were partnered, Aboriginal, had not graduated from Grade 12, and who were either on social assistance or who earned less than $20,000 per year.

There were no significant differences between the obstetrical/biological determinants of health between the two groups of women: gestation, somatic health complaints, parity, or perceived overall health status. The psychological variables of women from both programs were very similar. However, the “moods up and down” variable was significantly increased ($p<0.001$) in the women at the WC.

Post hoc analysis showed significant differences between women who exercise 2-3 times a week and exercise occasionally ($p=0.010$), and those who exercise 2-3 times a week and never exercise ($p=0.016$). There were significant differences between the women who had never smoked and quit smoking ($p=0.023$) and those who had never smoked and currently smoked ($p=0.020$). There were significant associations between women who used currently use drugs and those who had never used drugs ($p=0.010$) and those who had quit using drugs and those who were currently using drugs ($p=0.022$).

Table 5.5 Comparison of significant determinants between the two sites

	HMHB (n=330)		**WC** (n=72)		
	n	**%**	**n**	**%**	**p**
Marital Status					
Non-partnered	189	59.2	24	42.1	0.012
Partnered	130	40.8	33	57.9	
Ethnicity					
Aboriginal	194	59.1	61	98.4	<0.001
Non-Aboriginal	134	40.9	1	1.6	
Education					
<Grade 12	189	57.3	58	84.1	<0.001
≥Grade 12	141	42.7	11	15.9	
Moods up and down					
Yes	132	43.6	53	85.5	<0.001
No	171	56.4	9	14.5	
Exercise					0.017
Every day	95	29.5	33	46.5	
2-3 times a week	84	26.1	11	15.5	
Occasional	113	35.1	18	25.4	
Never	30	9.3	9	12.7	
Smoking					0.042
Never	57	17.5	4	5.6	
Quit smoking during or before pregnancy	95	33.8	24	33.8	
Current smoker	176	53.2	43	60.6	
Drug use					0.019
Never used such drugs	112	33.9	18	25.0	
Quit during or before pregnancy	167	50.6	33	45.8	
Current drug user	51	15.5	21	29.2	

5.3 HMHB Participants Compared to the Non-Participants

HMHB had entered data into an SPSS file for all women (participants and non-participants) for the first 6 months of the study. Therefore, limited information was available for 83 women who either chose not to participate in the study or who did not meet the inclusion criteria.

Table 5.6 shows that the women who participated in the study were significantly more likely to be married and to have completed Grade 12. There was no significant difference in either the age or ethnicity of the women or whether or not this was their first pregnancy.

Table 5.6 Comparison of participants and non-participants of HMHB

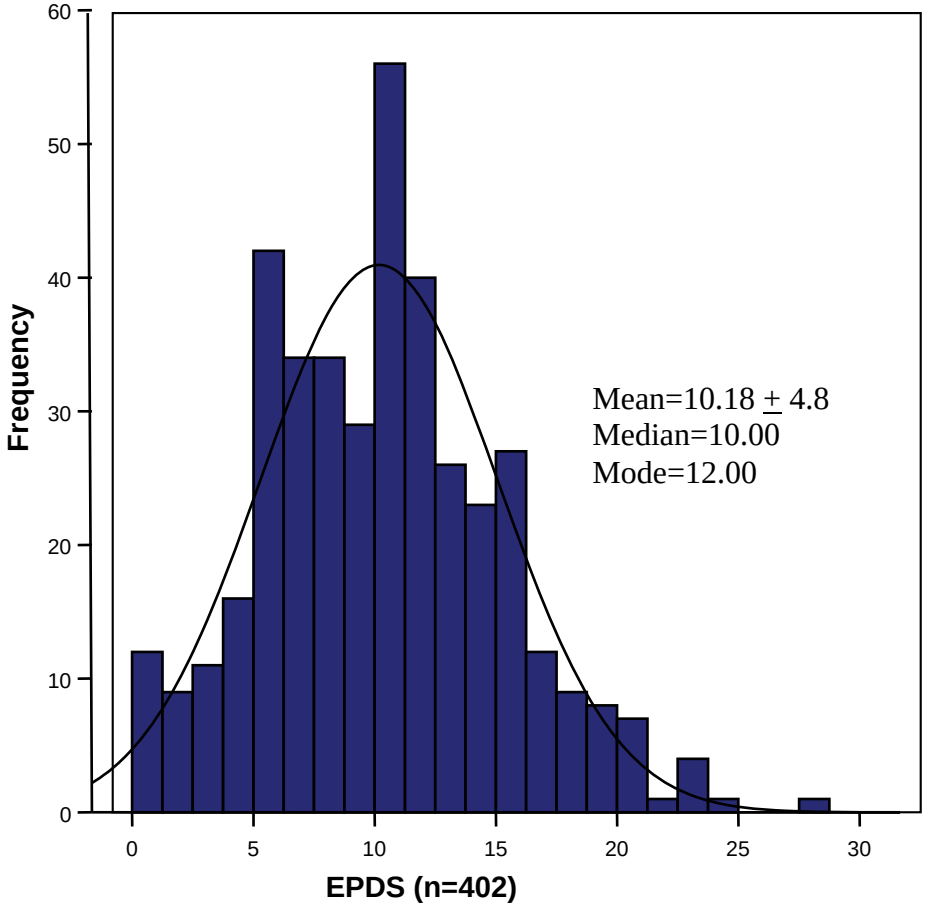
	Participants (n=317)		**Non-participants** (n=83)		
	n	**%**	**n**	**%**	**p**
Marital Status					
Non-partnered	191	59.1	62	74.2	0.009
Partnered	132	40.9	21	25.8	
Education					
<Grade 12	193	59.0	59	71.1	0.044
≥Grade 12	134	41.0	24	28.9	

PART TWO

5.4 Prevalence and Incidence of Antenatal Depression

The prevalence of minor antenatal depressive symptoms in this sample of 402 high-risk women, in the last seven days, was 53.5% (EPDS ≥10). Major depressive symptoms (EPDS ≥13) were reported by 29.5% of women. The prevalence of depression has been weighted for the age of the non-participants. Figure 5.2 depicts the histogram of the EPDS score and reports the mean, median, and mode score.

Figure 5.2 EPDS Score



Forty-three percent of the women reported a history of depression. These women were separated from those with no reported history of depression to determine the difference between the depressive symptoms in the two groups, and also to determine the number of women who were experiencing depression for the first time during pregnancy (incidence). The mean EPDS score for women with no history of depression was 9.18 ± 4.69 which was significantly lower than that of the women with a history of depression, 11.68 ± 4.88 ($p<0.0001$). From Table 5.7 we can see that the incidence of major depressive symptoms in the women who answered the question (n=384) was 21.7%.

Table 5.7 Incidence of depressive symptoms and mean EPDS scores in women with history of depression versus those with no history of depression

	No history of depression (n=167)		**History of depression** (n=217)		
	n	**%**	**n**	**%**	**p**
Minor depression (EPDS ≥10)					
yes	96	44.2	112	67.1	p<0.001
no	121	55.8	55	32.9	
Major depression (EPDS≥13)					
yes	47	21.7	71	42.5	p<0.001
no	170	78.3	96	57.5	

5.5 Sociodemographic, Obstetrical/Biological, Psychological, and Behavioural Determinants of Antenatal Depression

The sociodemographic determinants income, marital status, and education ($p < 0.25$) were entered into the logistic regression model. The final model, Table 5.8, shows that women who were on social assistance or earned less than $20,000 were almost twice as likely to be depressed. Widowed, separated, and divorced women were at 5 times the risk for depression, however, this was a small group (n=10), so the marital status variable was used as a dichotomized variable (partnered or non-partnered) in future analyses.

Table 5.8 Final model of sociodemographic determinants of antenatal depression (n=375)

	Adjusted Odds Ratio	**95% Confidence Limits**		**p**
Income <20,000/social assistance				
Yes	1.97	1.04,	3.74	0.037
Marital Status				
Single	1.00			
Common law	1.12	0.69,	1.81	0.645
Married	0.39	0.14,	1.01	0.071
Separated/Divorced, Widowed	5.15	1.28,	20.72	0.021

All obstetrical/biological variables $p<0.25$ were entered into the model using Forward Stepwise Logistic Regression. This included: number of pregnancies, number of somatic complaints, nausea and vomiting, and overall health today. In the final model for the biological/obstetrical determinants (Table 5.9), women who complained of nausea and vomiting were almost twice as likely to be depressed as those with no complaints of

nausea and vomiting. Women who rated their health as fair or poor report twice as much depression as those women who reported feeling good, very good, or excellent.

Table 5.9 Final model of obstetrical/biological determinants of antenatal depression (n=396)

	Adjusted Odds Ratio	95% Confidence Limits		p
Nausea and vomiting				
Yes	1.89	1.17,	3.05	0.010
Overall health today				
Good, very good, excellent	1.00			
Fair, Poor	1.96	1.21,	3.29	0.006

The variables that measure the psychological determinants $p \leq 0.25$ were entered into the model for logistic regression using a forward stepwise regression. The regression was done twice. First, stress, support, mother antenatal or postpartum depression, moods up and down, counselling in the past and now, food security, physical abuse, emotional abuse, sexual abuse, and history of depression were entered in the model. The number of women who reported a history of antenatal depression and a history of postpartum depression decreased the overall number of women who could be used in the regression analysis to 212. The overall final model (Table 5.10) did not change by taking out the history of either antenatal or postpartum depression, but it was more stable with smaller confidence intervals. Therefore, these two variables were left out of the model.

As the final model for the psychological determinants shows, women with high levels of stress were 3.2 times more likely to be depressed, women with medium levels of support were less likely to be depressed, and women with high support were 0.05 times less likely to be depressed. Women with a history of depression and moods up and down were more than twice as likely to experience depression.

Table 5.10 Final model of psychological determinants of antenatal depression (n=315)

	Adjusted Odds Ratio	95% Confidence Limits	p
Stress			
Low	1.00		
High	3.23	1.69, 6.17	<0.001
Support			
No support	1.00		
Low	0.09		0.008
Medium	0.08	0.02, .06	0.008
High	0.05	0.01, .40	0.002
History of depression	2.42	1.42, 4.42	0.001
Moods up and down	1.98	1.15, 3.40	0.013

There was no interaction between the terms. There was confounding between moods up and down and history of depression. To explore this relationship further cross tabulation was done, and a significant relationship was found between these two variables (p=0.002). The analysis was repeated using the individual stressors (p<0.25). The variables with a p value greater than or equal to 0.25 included: stressors-pregnancy, partner, money, children, family, where I live, baby's health, own health, and work, support of partner, physical, emotional, and sexual abuse; food security questions, along with history of depression, moods up and down, counselling now and in the past.

The second logistic regression model for these determinants is shown in Table 5.11. In this model, women with a history of depression were 2.5 times as likely to be depressed and those reporting moods up and down almost twice as likely to be depressed. Women who were stressed by their partner and their baby's health were more than twice as likely to be depressed. The support of a friend or female relative was protective for depression in this sample.

Table 5.11 Second final model of psychological determinants of antenatal depression (n=306)

	Adjusted Odds Ratio	95% Confidence Limits	p
History of depression	2.52	1.45, 4.38	0.001
Moods up and down	1.95	1.11, 3.41	0.019
Stressors			
Partner	2.33	1.26, 4.32	0.007
Baby's health	2.58	1.25, 5.32	0.010
Support			
Friend	0.53	0.29, 0.99	0.047
Female relative	0.47	0.24, 0.94	0.031

To derive a model of behavioural determinants, all variables $p \leq 0.25$ were entered into the analysis: exercise, smoking, alcohol use, drug use, and unplanned pregnancy. Table 5.12 shows the final model from the behavioural variables. Women who exercised occasionally were a little more than twice as likely to be depressed and those who never exercised were depressed 3 times as often than women who exercised daily. Women who had quit smoking were 2.8 times more likely to be depressed and those who were currently smoking were depressed 2.9 times as much. No interaction or confounding was present.

Table 5.12 Final model of behavioural determinants of antenatal depression (n=382)

	Adjusted Odds Ratio	95% Confidence Limits	p
Exercise			
Every day	1.00		
Occasional	2.15	1.21, 3.82	0.009
Never	3.16	1.34, 6.54	0.007
Smoking			
Never smoked	1.00		
Quit during or before pregnancy	2.76	1.17, 6.48	0.019
Current smoker	2.98	1.43, 6.69	0.003

5.6 Final Model for Determinants of Antenatal Depression

When analyzing the final logistic regression, rather than using $p \leq 0.25$, a higher p-value of <0.10 was used due to the large number of variables. As a result, the following variables were included in the analysis: Overall health - dichotomized, nausea and vomiting, marital status, stressors - three categories, somatic complaints - five categories,

support - 4 categories, sexual abuse, history of depression, moods up and down, exercise, smoking, alcohol use, drug use, unplanned pregnancy, income-dichotomized, and education-dichotomized.

The final logistic regression model, as depicted in Table 5.13, shows that depression in this group of women was related to a combination of psychological and behavioural determinants (n=261). Women with a history of depression were more than three times more likely and those whose moods go up and down were twice as likely to be depressed. Those women who experienced highest levels of stressors were 2.64 times more likely to be depressed. Women who currently smoked were 3.19 times more likely to be depressed than those who had never smoked. Support was protective for depression.

Table 5.13 Final model for determinants of antenatal depression (n=261)

	Adjusted Odds Ratio	95% Confidence Limits	p
Moods up and down	2.97	1.59, 5.53	0.001
Smoking			
Never smoked	1.00		
Quit smoking	1.87	0.63, 5.52	0.256
Current smoker	3.19	1.16, 8.71	0.017
History of depression	3.26	1.75, 5.86	<0.001
Stressor			
Low stressors	1.00		
Medium stressors	0.87	0.42, 1.81	0.719
High	2.64	1.26, 5.07	0.010
Total support	0.61	0.42, 0.89	0.011

All combinations of interaction were tested: moods and history of depression, moods and support, moods and stress, moods and smoking, history of depression and support, history of depression and support, history of depression and stress, history of depression and smoking, stress and support, stress and smoking, support and smoking. There was no interaction between any of the variables. There was confounding between moods up and down and history of depression.

5.7 Prevalence and Determinants of Antenatal Depression in Different Groups of Women

5.7.1 Aboriginal compared to non-Aboriginal women

The prevalence of depression in the Aboriginal compared to non-Aboriginal women is shown in Table 5.14.

Table 5.14 Prevalence of major depression in Aboriginal and non-Aboriginal women

	n	EPDS<13 (%)	EPDS≥13 (%)	p
Aboriginal	256	67.8	32.2	0.261
Non-Aboriginal	134	73.3	26.7	

Table 5.15 shows the significant sociodemographic, obstetrical/biological, psychological, and behavioural determinants of antenatal depression in the Aboriginal compared to non-Aboriginal women. Both groups of women were the same average age, but there were some significant differences: more of the Aboriginal women had not completed Grade 12, lived on social assistance, but reported that their housing were adequate. Significantly more of the Aboriginal women had a greater number of pregnancies although the ages of the two groups were similar. Aboriginal women reported more worries about food security, less supports, and more difficulty with moods going up and down (p=0.054), while more of the non-Aboriginal women reported a history of depression.

There was no significant difference in the number of stressors. More of the Aboriginal women currently smoked and had smoked in the past than the non-Aboriginal women. The use of alcohol was reported by twice as many Aboriginal women, with only nine percent reporting not having used alcohol at some time. Aboriginal women reported almost three times as much drug use during pregnancy and fewer had quit before the study. There were highly significant differences in the risk behaviours such as tobacco, alcohol, and drug use between the two groups.

Table 5.15 Comparison of significant determinants in Aboriginal women and non-Aboriginal women

	Aboriginal (n=256)		**Non-Aboriginal** (n=134)		
	n	**%**	**n**	**%**	**p**
Education					<0.001
<Grade 12	185	72.5	57	42.2	
≥Grade 12	70	28.5	78	57.8	
Income					<0.001
<20,000/social assistance	222	87.4	93	68.9	
>20,000	32	12.6	42	31.1	
Parity					
Primipara	82	32.2	67	49.6	0.001
Multipara	173	67.8	68	50.4	
Support					0.018
None	16	6.4	2	1.5	
Low	116	46.4	49	36.6	
Medium	84	33.6	58	33.6	
High	34	13.6	25	18.7	
Food Security					0.025
Low		0		0	
Medium	107	47.8	68	60.7	
High	117	52.2	44	39.1	
History of depression					0.023
Yes	98	39.7	69	52.3	
No	149	60.3	63	47.7	
Smoking					<0.001
Current smoker	151	59.4	60	45.8	
Quit smoking	83	32.7	30	22.9	
Never smoked	20	7.9	41	31.3	
Alcohol use					0.002
Current drinker	34	13.3	9	6.7	
Quit drinking	196	76.9	97	71.9	
Never drank	25	9.8	29	21.5	
Drug use					<0.001
Current drug user	60	23.5	11	8.1	
Quit drug use	125	49.0	70	51.9	
Never used such drugs	70	27.5	54	40.0	

Post hoc analysis showed significant differences between women with no support and those with two supports (p=0.026), women with no support and those with three supports (p=0.027), those with one support and those with two supports (p=0.042), and those with two supports and those with three supports (p=0.041). Significant differences were seen between the women who had never smoked and those who had quit smoking (p<0.001) and those who never smoked and those who were currently smoking (p<0.001). The significant differences in alcohol use were between women who never

used alcohol and those who had quit using alcohol (p=0.004), those who never used alcohol and those who currently used alcohol (p=0.001), and those who had quit using alcohol and those who were currently using alcohol (p=0.004). Women who never used drugs and those who had quit using drugs (p<0.001) and the women who had quit using drugs and those who were currently using drugs (p=0.002).

Logistic regression was done on each separate group including those variables that were significant (p<0.25) in the bivariate analysis with the EPDS (≥13) in all women. The determinants were similar. However, history of depression and moods going up and down were twice as likely to be associated with depression in Aboriginal compared to four times as likely in the non-Aboriginal women. High levels of stressors were significant in only the Aboriginal women. See Table 5.16.

Table 5.16 Final models for antenatal depression in Aboriginal and non-Aboriginal women

Aboriginal women (n=182)	**Adjusted Odds Ratio**	**95% Confidence Limits**	**p**
History of depression	2.14	1.07, 4.10	<0.001
Moods up and down	2.43	1.23, 4.72	<0.001
Stressors			
Low	1.00		
High	3.13	1.13, 8.93	0.020
Non-Aboriginal women (n=99)			
History of depression	4.15	1.44, 12.04	0.008
Moods up/down	4.31	1.45, 12.85	0.008

5.7.2 Women 21 and under compared to those over 21

As expected there was a significant difference (p<0.001) between the age of the younger women (18.74 years ± 1.16) and the older women (26.69 years ± 4.37). Women 21 and under experience more depressive symptoms, as seen in Table 5.17, but the difference was not significant.

Table 5.17 Prevalence of depression in women 21 and under compared to women over 21

	n	**EPDS<13 (%)**	**EPDS≥13 (%)**	**p**
Women 21 and under	197	68.3	31.7	0.382
Women over 21	205	72.6	27.4	

Table 5.18 illustrates the sociodemographic, obstetrical/biological, psychological, and behavioural determinants of antenatal depression in women 21 years of age and under compared to those 21 and over. The younger women were significantly more likely to earn less, be non-partnered, be on social assistance, and to have not completed Grade 12 than the older women. While there was no difference in the gestation of younger women compared to older women, there was a significant difference in the number of somatic complaints and health problems, and the number of pregnancies in the older women. There was no difference between the gestations of the pregnancy in the younger versus the older women. There were no significant differences in the psychological determinants between the two groups. There were few differences between the behavioural determinants in the young compared to older women; only the number of women who had never used or who had quit using drugs during or before pregnancy was significantly different.

Table 5.18 Comparison of significant determinants in women 21 and under and women over 21

	≤21(n=197)		**>21**(n=205)		
	n	**%**	**n**	**%**	**p**
Marital Status					
Non-partnered	117	65.0	96	49.0	0.013
Partnered	63	35.0	100	51.0	
Education					<0.001
<Grade 12	151	77.0	96	47.3	
≥Grade 12	45	23.0	107	52.7	
Parity					<0.001
Primipara	114	57.9	43	21.0	
Multipara	83	42.1	162	79.0	
Somatic/health problems					<0.001
0	58	29.4	28	13.7	
1	47	23.9	46	22.4	
2	42	21.3	41	20.0	
3	27	13.7	41	20.0	
4 or more	23	11.7	49	23.9	
Drug use					0.002
Current drug user	36	18.3	36	17.6	
Quit during or before pregnancy	113	57.4	87	42.4	
Never used such drugs	48	24.4	82	40.0	

Post hoc analysis of the significant variables showed differences between the women with no somatic complaints compared to those with one complaint (p=0.023), those with one compared to two complaints (p=0.027), between those with no complaints and those with three complaints (p=0.001), those with no complaints compared to those with four complaints (p<0.001), those with two compared to those with four complaints (p=0.020), and those with one complaint compared to those with four complaints (p=0.017). Only the women who never used drugs were significantly more different than those women who had quit using drugs (p=0.001).

The variables that were used in separate logistic regression analyses with EPDS (≥13) of all women were re-analyzed with the women 21 and under and over 21 (i.e., overall health, nausea and vomiting, stress, food security, support, sexual abuse, history of depression, moods up and down, exercise, smoking, alcohol, drugs, unplanned pregnancy, income-dichotomized, education-dichotomized to completed grade 12 or not). Table 5.19 shows that the adjusted Odds Ratio for the variable moods up and down was similar for both groups of women. Women over 21 who had reported low amounts of support were 5.71 times more likely to be depressed. Those women who had reported their health as excellent were 29% less likely to be depressed.

Table 5.19 Final model of determinants of antenatal depression in women 21 and under and women over 21

Women over 21 (n=128)	**Adjusted Odds Ratio**	**95% Confidence Limits**	**p**
Moods up/down	3.61	1.22, 10.75	0.021
Support			
High	1.00		
Low	5.71	0.99, 32.71	0.050
Rate overall health-			
Excellent	1.00		
Very good	0.02	0.00, 0.14	<0.010
Women 21 and under (n=125)			
Moods up/down	3.79	1.09, 12.55	0.032

5.7.3 Non-partnered women compared to partnered women

As shown in Table 5.20, the prevalence of major depressive symptoms in non-partnered women was 32.9% compared to 28.2 for partnered women.

Table 5.20 Prevalence of depression in non-partnered and partnered women

	n	EPDS<13 (%)	EPDS≥13 (%)	p
Non-partnered	215	67.1	32.9	0.334
Partnered	163	71.8	28.2	

As Table 5.21 shows, more of the non-partnered women fell into the lowest income level and more were on social assistance, they were significantly younger, and were more likely to have not completed Grade 12. Non-partnered women were significantly younger than partnered women (21.9 versus 24.1 years, $p<0.001$). There were few significant differences in the behavioural determinants, with the exception of increased current and previous smoking in the non-partnered group (88.9% versus 76.7%). Non-partnered women reported significantly less support than the partnered women did. They also reported significantly more stressors and greater concerns about their food security.

Table 5.21 Comparison of significant determinants in non-partnered women and partnered women

	Non-partnered (n=215)		**Partnered** (n=163)		
	n	**%**	**n**	**%**	**p**
Income					0.002
<20,000/social assistance	178	90.4	125	78.3	
>20,000	19	9.6	34	21.7	
Overall health today					0.021
Excellent	14	7.3	13	8.6	
Very good	46	24.0	50	33.1	
Good	87	45.3	70	46.4	
Fair	30	15.6	16	10.6	
Poor	15	7.8	2	1.3	
Stressors					<0.002
None	16	7.5	35	21.5	
Low	62	29.5	36	22.1	
Medium	77	36.8	54	33.1	
High	58	27.2	38	23.3	
Support					0.014
None	12	5.8	5	3.1	
Low	103	49.5	60	37.3	
Medium	73	35.1	59	36.6	
High	20	9.6	37	23.0	
Smoking					0.006
Current smoker	123	59.4	79	48.5	
Quit smoking during or before pregnancy	61	29.5	46	28.2	
Never	23	11.1	38	23.3	

The post hoc analysis showed significant differences in the perception of health category between women with excellent health compared to those with poor health ($p=0.022$), those with very good health compared to those with poor health ($p=0.007$), and those with good health compared to those with poor health ($p=0.002$). Women who experienced no stressors compared to those who said they experienced low levels of stressors ($p<0.001$), those who reported no stressors compared to those with medium stressors ($p=0.001$), and those who stated they had no stressors compared to those who stated they had high stressors ($p<0.001$) but no other combination was relevant. There were significant differences between women with no support and those with high support ($p=0.013$), and those with low support and those with high support ($p<0.001$). In addition, there were significant differences between the women who had never smoked and those who had quit smoking ($p=0.017$) and those who had never smoked and those who were currently smoking ($p=0.002$).

As in the previous analyses, the variables from the bivariate analysis, $p<0.10$, were analyzed by logistic regression separately for the non-partnered women and the partnered women. As Table 5.22 reflects, non-partnered women who reported moods going up and down have 6.65 times the risk of depression. Partnered women were 6.8 times more likely to be depressed if they had a history of depression. Rating one's health as "excellent" was protective for depression.

Table 5.22 Final model of determinants of antenatal depression in non-partnered and partnered women

Non-partnered women (n=136)	**Adjusted Odds Ratio**	**95% Confidence Limits**	**p**
Moods up/down	6.65	2.23, 19.75	0.001
Partnered women (n=106)			
History of depression	6.80	1.73, 26.62	0.006
Rate health			
Excellent	1.00		
Very good	0.01	0.00, 0.23	0.003

5.8 The EPDS score

The internal reliability of the EPDS was determined by the Cronbach's alpha coefficient. While the EPDS was presented as an overall score for depression screening, as Table 5.23 shows, the mean scores of each item differed greatly from a high of 1.66 for item 3, blame, to a low of 0.27 for self-harm.

Table 5.23 Mean score and SD of EPDS items (0-3)

		Mean ± SD
1	I have been able to laugh and see the funny side of things	0.37 ± 0.56
2	I have looked forward with enjoyment to things	0.52 ± 0.64
3	I have blamed myself unnecessarily when things went wrong	1.66 ± 0.84
4	I have been anxious or worried for no good reason	1.54 ± 0.80
5	I have felt scared or panicky for no very good reason	1.19 ± 0.90
6	Things have been getting on top of me	1.37 ± 0.73
7	I have been so unhappy that I have had difficulty sleeping	0.99 ± 0.95
8	I have felt sad or miserable	1.25 ± 0.74
9	I have been so unhappy that I have been crying	1.01 ± 0.75
10	The thought of harming myself has occurred to me	0.27 ± 0.58
	TOTAL	10.17 ± 4.81
	Cronbach's alpha coefficient	**0.845**

5.9 Exploring the EPDS

An exploratory factor analysis, using Varimax rotation, was done to determine if there was more than one underlying dimension to the EPDS in this population of women. A minimum factor score of 0.40 was used. As Table 5.24 shows, three factors emerge when all of the high-risk women were included in the analysis.

The first factor included the three shaded items in the first column, 3, 4, and 5, which might be described as "anxiety" symptoms (blame, feeling anxious, feeling scared or panicky). The Cronbach's alpha coefficient of these three anxiety items was 0.709.

The second factor included the shaded items in the second column that may be labelled "depressive" symptoms. This included items 1, 2, (ability to laugh, looking forward with enjoyment). Munro considers a differential of >0.20 the appropriate cut off for inclusion of an item that occurs in more than one factor.[198] In this analysis the difference in the score of item 8, sad or miserable in the depression or anxiety factor was 0.137; however, inclusion of this item in the depression factor improved the Cronbach's alpha coefficient from 0.570 to 0.675, therefore it was left in as a factor. The third factor involved one item, 10, self-harm thoughts.

Table 5.24 Factor analysis of EPDS (n=402)

	Factors		
Items on EPDS	**"Anxiety"**	**"Depression"**	**Self-harm**
I have been able to laugh and see the funny side of things	0.088	**0.722**	0.206
I have looked forward with enjoyment to things	0.069	**0.798**	0.031
I have blamed myself unnecessarily when things went wrong	**0.752**	0.179	0.012
I have been anxious or worried for no good reason	**0.725**	0.073	0.198
I have felt scared or panicky for no very good reason	**0.761**	0.089	0.241
Things have been getting on top of me	0.553	0.485	-0.008
I have been so unhappy that I have difficulty sleeping	0.453	0.446	0.289
I have felt sad or miserable	0.445	**0.582**	0.306
I have been so unhappy that I have been crying	0.343	0.469	0.490
The thought of harming myself has occurred to me	0.137	0.144	**0.900**
Variance %	25.27	20.18	13.67
Cronbach's alpha coefficient	0.709	0.678	

The anxiety and the depression factors were summed into new variables, labelled subscales. The amount of the EPDS score from the anxiety subscale was 4.39 (43% of the variance in the total EPDS score), and the depression subscale was 2.14, accounting for 21% of the variance, and the one self-harm item was 0.27 (2.6% of the variance in the EPDS). Then these subscales were compared in the different groups of women using T-tests. Because of the small number of some of the responses on the self-harm item, the Mann-Whitney U test was used for this analysis.

5.10 Determinants Associated with Anxiety, Depression and Self-harm

The final models for the anxiety, depression, and self-harm subscales were determined using linear regression with the significant variables ($p<0.25$) in individual bivariate analyses. See Tables 5.25-5.27.

5.10.1 Anxiety subscale

Significant variables moods up and down, history of depression, food security, age, number of pregnancies, number of somatic complaints, stress of pregnancy, partner, baby's health, baby's birth, and money were regressed against the anxiety subscale. The final model was shown in Table 5.25, it accounted for only 19% of the variance of the anxiety subscale.

Table 5.25 Final model for determinants of anxiety subscale (n=232)

	β Coefficients	95% Confidence Limits	p
History of depression	0.965	0.54, 1.39	<0.001
Moods up and down	0.641	0.21, 1.06	0.003
Number of pregnancies	0.184	0.07, 0.29	0.002
Stressors	0.287	0.17, 0.40	<0.001

5.10.2 Depression subscale

Significant bivariate variables, food security, number of pregnancies, moods up and down, support of partner, mother, friend, female relative, other, history of emotional, physical and sexual abuse, income, and ethnicity were regressed against the depression subscale. The final model in Table 5.26 accounted for 15.8% of the variance in the depression subscale.

Table 5.26 Final model for determinants of depression subscale (n=229)

	β Coefficients	95% Confidence Limits	p
Moods up and down	0.653	0.32, 0.97	<0.001
Stressors	0.278	0.09, 0.46	0.003
Number of pregnancies	0.082	0.01, 0.18	0.025
Support	-0.288	-0.47, -0.10	0.002

5.10.3 Self-harm subscale

History of depression, moods up and down, support of partner, mother, friend, female relative, other, history of physical abuse, ethnicity, education, stress of pregnancy, partner, money, own health, baby's health, children, and family were entered into a linear regression against the self-harm item. The final model accounted for 23.8% of the variance in the self-harm subscale.

Table 5.27 Final model for determinants of self-harm subscale (n=321)

	β Coefficients	95% Confidence Limits	p
Moods up and down	0.142	0.01, 0.27	0.031
Stressors	0.089	0.05, 0.12	<0.001

The prevalence of self-harm thoughts in the last seven days was examined in all women using the self-harm subscale. This included women who were depressed, Aboriginal, non-partnered, 21 and under, and those who currently used alcohol.

As Table 5.28 shows, depressed women were most likely to express thoughts of self-harm. The women who reported that they currently used alcohol were most likely to state that they had thought of suicide often in the last seven days. Twenty-three percent of the women 21 and under had self-harm thoughts, but they were the lowest group to report having these thoughts often in the last seven days.

Table 5.28 Comparison of self-harm thoughts in different groups of women

	Never (%)	**Yes (%)**	**Of those who said yes,** Hardly ever (%)	Sometimes (%)	Yes, often (%)
All women (n=402)	79.6	20.4	15.1	4.3	1.0
Depressed women (n=117)	52.1	47.9	30.8	13.7	3.4
Aboriginal women (n=253)	76.5	23.5	16.1	5.9	1.6
Non-partnered women (n=211)	76.0	24.0	18.3	4.7	0.9
Women <21years (n=197)	76.7	23.3	17.0	5.7	0.6
Alcohol users (n=54)	69.0	31.0	20.9	4.7	4.7

5.11 Comparison of the EPDS Factors in the Different Groups of Women

Table 5.29 shows the differences between mean anxiety, depression, and self-harm scores for Aboriginal and non-Aboriginal women. It appears that there was no significant difference between the mean anxiety score in the Aboriginal compared to non-Aboriginal women; however, there was a significant difference between them in the depression items and the self-harm thoughts.

There was no statistically significant difference between non-partnered and partnered women in the either the anxiety or depression subscale or the self-harm item. The younger women were significantly more likely to experience anxiety symptoms compared to older women. There was no significant difference between the two groups in the depression subscale or the thoughts of self-harm item.

Table 5.29 Comparison of factors of EPDS in different groups of women

	Aboriginal (n=255)	**Non-Aboriginal** (n=134)	**Non-partnered** (n=215)	**Partnered** (n=163)	**Age <21** (n=125)	**Age >21** (n=277)
Anxiety subscale (range = 0-9)						
Mean ± SD	4.43±1.58	4.43±1.37	4.54±2.06	4.32±1.95	4.70±2.04	4.10±1.98
p*	0.77		0.28		<0.01	
Cronbach's alpha	0.678	0.677	0.750	0.642	0.676	0.709
Depression subscale (range = 0-8)						
Mean ±SD	2.30 ±2.02	1.88±2.05	2.23±1.51	2.08±1.56	2.20±1.52	2.06±1.56
p*	<0.01		0.35		0.36	
Cronbach's alpha	0.689	0.737	0.683	0.688	0.682	0.673
Self-harm (range = 0-3)						
Mean ±SD	0.33±0.66	0.17±0.41	0.31±0.57	0.23±0.56	0.25±0.57	0.29±0.59
p**	0.006		0.207		0.460	

*significance $p \leq 0.05$, determined using independent sample t-test

** significance $p \leq 0.05$, determined using Mann-Whitney U-test

CHAPTER 6

DISCUSSION

This discussion of antenatal depression and its determinants, as outlined in the proposed theoretical model, provides a detailed response to the findings of the study in relation to the literature. Also, future directions for research are proposed.

With 402 participants, this study was one of the larger epidemiological studies of the six studies of high-risk pregnant women where antenatal depression was the outcome of interest (Appendix A).

6.1 Prevalence and Incidence of Antenatal Depression

Women in this study showed increased levels of depressive symptoms, with the prevalence of antenatal depression of 29.5%. This was similar to the rates (25-29%) found in other studies of high-risk pregnant women and in our pilot study (Appendices B and C).[5, 12, 67, 68, 70, 82]

Most of the women in this study were in their second trimester; the average gestation was 15.2 $\pm$ 6.5 weeks. In a study of 128 women in their second trimester, Jesse et al. found 27% of the women were depressed.[68] Hobfall et al. found similar rates of depression in women in their second and third trimesters (27.6% and 24.5%).[12] Also using the EPDS, Bolton et al. reported a depression rate of 29% in 407 inner-city women in the UK, 25% in the 2nd trimester and 75% in the 3rd trimester.[67] The high rates of depression in the second trimester found in these studies challenge the myth that this is the time of least depression in the perinatal period.[48, 51]

The incidence of depression in pregnancy, that is women who report depression for the first time (i.e., no history of depression) during this pregnancy was 21.7%: this was half the rate of women with a history of depression (42.5%, $p<0.001$). While previous studies have cited the importance of past psychiatric problems and specifically history of depression as precursors for depression,[69, 70] I was unable to find comparable incidence rates of depression in pregnancy in the literature. Women who report that they

have not experienced depression before may not have attributed their feelings as depressive. In an evaluation of the Postpartum Depression Support Program in Saskatoon, 61% of the women had experienced a previous depression and 40% of the women were attending the group following their second delivery. Many of the women said that they had been depressed in the past but had not realized what was happening to them and that their doctors did not diagnose the depression until it became very severe with the second child.[206]

6.2 Determinants of Antenatal Depression

The women in this study were identified as high-risk by the programs that they were recruited through. The analysis of the determinants confirmed that the women in the study had lower income, lower level of education, a majority were of Aboriginal status, and overall they were younger than the average woman having a baby.

6.2.1 Sociodemographic determinants

Approximately 13% of women who deliver in the Saskatoon Health Region are Aboriginal.[207] Almost two-thirds of the women in this study self-identified as either Aboriginal or Métis. Ethnicity was associated with increased depressive symptoms on the both the overall EPDS score but most notably on the depression subscale, which was discussed in detail in sections 6.4.1 and 6.7. The mean age of women in the study was 22.8 years. This was much younger than the average age of other new mothers in Saskatchewan, which is 27.6 and in Canada where the average age of women giving birth is 29.0 years.[208]

More than half of the women in this study were non-partnered (never married, widowed, separated, or divorced). Lone motherhood has been associated with depression, higher levels of stress and increased use of the mental health system.[7, 162] As with previous research, women in this study who were separated, divorced or widowed experienced significantly more depressive symptoms than married or never married women.[69, 209]

Almost two-thirds of the women in this study had not completed Grade 12. Most of the women in the study were Aboriginal. Over half of Canadian Aboriginal adults have not completed high-school.[210] There are contradictory reports of the association between low education and depression. Most studies have found the likelihood of depression was

lower among women who completed high-school,[67, 69, 211] but Hobfall et al., like this study, found no association in bivariate comparisons.[12] As many as 85% of the study participants lived on less than $20,000 per year or on social assistance, compared to 26.9% of families with children in Saskatoon who live below the poverty line.[212]

6.2.2 Obstetrical and biological determinants

Women were seen at their first prenatal visit early in the second trimester of pregnancy (15.2 $\pm$ 6.2 weeks). This was later than would be advised for adequate prenatal care,[70] however women in the HMHB program might have already visited their family doctor prior to joining the program. Women in Saskatchewan, aged 15-49, give birth to 1.9 children which was higher than the national average of 1.5 children per woman.[208] The women in this study had an average of 2.6 $\pm$ 2.03 pregnancies (including this pregnancy), which was close to the average number of births to Aboriginal women (2.7) in Saskatchewan.[163] Despite the higher than average number of pregnancies in this group of low-income, mostly non-partnered women, increased parity was not associated with depression in the final model except in the anxiety and depression subscale.

Authors of previous studies have attributed a history of abortions as a risk factor for depression in the present pregnancy.[19, 58] According to Koyama and Williams,[213] up to 40% of women may have had an abortion sometime in their reproductive life. This is almost double the 26% of women in this sample who reported having had an abortion. There was no association between either having had an abortion or the number of previous abortions and depression in this sample; however, intentional, therapeutic abortions and miscarriages were not differentiated in this study, so this lack of association may not be meaningful.

As with Kelly et al.,[49] there was a significant bivariate association between nausea and vomiting and depressive symptoms, with depressed women more than twice as likely to report nausea and vomiting. Pregnant women are reported to underestimate their illness during pregnancy[201] and since this information was based on recall and was collected early in pregnancy, a stronger association might be found by looking at the prenatal record at the end of the pregnancy.

Rating one's health as poor has been linked to increased likelihood of depression in pregnancy.[56] Similarly, women in this study who reported their overall health as either

fair or poor were twice as likely to experience depression as those who rated it as either excellent, very good, or good.

6.2.3 Psychological determinants

Over forty percent of the women in this study reported a history of depression. This was twice the rate seen in a study of Brazilian inner-city women by Lovisi et al..[69] They reported an almost 8-fold increase in depression symptoms in women with a history of depression[69] and women in a primary care setting were 4.9 times more likely to have antenatal depression[56] compared to a 2.67 times increase in the bivariate analysis in this study.

Mood swings were associated with depression, anxiety, and with self-harm thoughts. There may be a perceived overlap between mood swings and depression and some may believe them to be the same concept, but there was no evidence of collinearity between mood swings and depression in this study (Tolerance = 0.984). Other studies found that mood swings were independently associated with depression and anxiety.[55] Frequent changes in mood are important as they may represent an increased vulnerability to developing depression.[184]

Life stressors have been associated with increased depression in pregnancy,[214] and with emotional dysregulation.[11] Women in this study, as with other high-risk studies, reported high levels of stressors linked to increased depressive symptoms.[68, 69] The most frequently reported source of stressors were money (39.9%), partner (27.5%), family (19.8%), and "other" (28.6%). But there were significant bivariate associations between depression and stressors related to the partner ($p<0.001$), money ($p=0.030$), children ($p=0.034$), family ($p=0.002$), where the woman lives ($p=0.023$), the health of the baby ($p=0.001$), and the woman's own health ($p<0.001$). Similar to other studies of pregnant women, the women in this study reported feeling increased stress about being pregnant and particularly about the health of the baby.[215, 216]

Consistent with previous studies, social support, particularly from the partner was significantly associated with a lower likelihood of antenatal depression in bivariate analysis and in the final model.[6, 67, 175] However, some studies of inner-city women have noted a lack of a significant association between support and depression,[69] which may have been due to the tools that they used to assess support.

6.2.4 Behavioural determinants

Exercise has been reported to elevate mood and decrease the symptoms of major depressive disorder.[217] This study shows a clear link between depressive symptoms and exercise. There was a dose-response with depressive symptoms between women who get 20 minutes of exercise daily compared to those women who exercised 2-3 times a week (OR 1.72, 95% CI 0.92, 3.20), occasionally exercised (OR 2.23, 95% CI 1.26, 3.92), or who never exercised (OR 3.18 95% CI 1.47, 6.87). Only 9.9% of women in the study reported never exercising, however according to the staff at WC, 20 minutes of exercise each day would not difficult to achieve for most of the women, as they were unlikely to have vehicles and therefore, walk to shops or to attend appointments.

The relationship between current and previous smoking and depression in pregnancy has been identified by others.[15, 77] Smoking in pregnancy is linked to preterm birth,[91, 103] respiratory and behavioural problems in children,[186, 218] increased alcohol use,[187] and drug use.[219] The rate of smoking in this sample was high (55%) compared to other pregnant women in Saskatchewan (20%)[220] and to pregnant women in Canada (9%).[221] In the pilot study, 75% of the women had reported current tobacco use, and HMHB had implemented smoking cessation and second-hand smoking information to the mothers in the intervening time.[82] Only 15% of the women in the study reported having never smoked compared to 60% in the general population of women aged 20-44 years.[220]

This study confirms a dose-response for depression and smoking in pregnancy that was previously reported by Zhu et al..[77] Previous smokers were 2.87 times more likely (95% CI 1.24, 6.56), and current smokers 3.31 times more likely (95% CI 1.495, 7.338) to be depressed than women who reported never smoking. While similar proportions of primigravidas and multigravidas had either never smoked or quit smoking, as with other studies, the multigravidous women were more likely to be current smokers (31% versus 69%).[15]

Alcohol use in pregnancy is problematic due to effects of its use on the developing fetus,[188] but also because of the depressant effects of alcohol and the high comorbidity of alcohol abuse and depression.[187] Thirty-five percent of the depressed pregnant women (14-17 weeks gestation) studied by Pajulo et al. reported using

alcohol.[14] Contrary to these findings, just over 10% of women in this study stated that they currently used alcohol. This prevalence is in keeping with, or is higher than other studies of alcohol use and antenatal depression in high-risk women,[70, 211] but according to the Public Health Agency of Canada 13% of women in Canada drink in pregnancy.[222] The rate of drinking found in this study may be lower than the national average because the women were asked once, early in pregnancy, whether they drank, rather than being asked at the end of pregnancy or after the baby was born if they had consumed any alcohol during the entire pregnancy. In the pilot study data, the number of women who admitted to using alcohol on the discharge interview was 35% compared to 16% who acknowledged drinking at the time of their initial interview in pregnancy. As a result, the drinking rate reported in this study was likely underestimated.

The women who had quit drinking before or since becoming pregnant were twice as likely to be depressed compared to the women who stated that they had never used alcohol in the bivariate analysis. Over 30% of women who had currently or previously used alcohol scored $\geq$13 on the EPDS compared to 18% of the women who reported never using alcohol (OR 2.06, 95% CI 1.00, 4.24). Women may have undereported the amount of alcohol that they consumed because the data were collected by HMHB program staff who counsel the women to decrease their substance use in pregnancy, 15% of the women who attended WC stated that they currently drank alcohol, but this was not a significantly increased amount compared to HMHB. Staff at WC suspected that the lower than expected rate of drinking in this group did not mean that they were not engaged in substance abuse, and that probably there was increased use of illicit drugs by the women.

Indeed, more women in the study did use drugs compared to alcohol. Eighteen and a half percent of women in the study stated that they currently used drugs, with 8.2% reporting daily use of some illicit substance. One other study of high-risk women reported that 14.3% of women used marijuana in the past 30 days and found a significant association ($p<0.001$) with depressive symptoms.[219] A study in downtown Toronto, Canada, found that 12.5% of babies born had been exposed to cocaine before birth.[223] Women who had quit using drugs either during or before pregnancy were 1.67 (95% CI 1.00, 2.78) times more likely to be depressed and those who had currently used drugs

have 1.85 times the likelihood for depression (95% CI 0.98, 3.50) compared to women who had never used drugs.

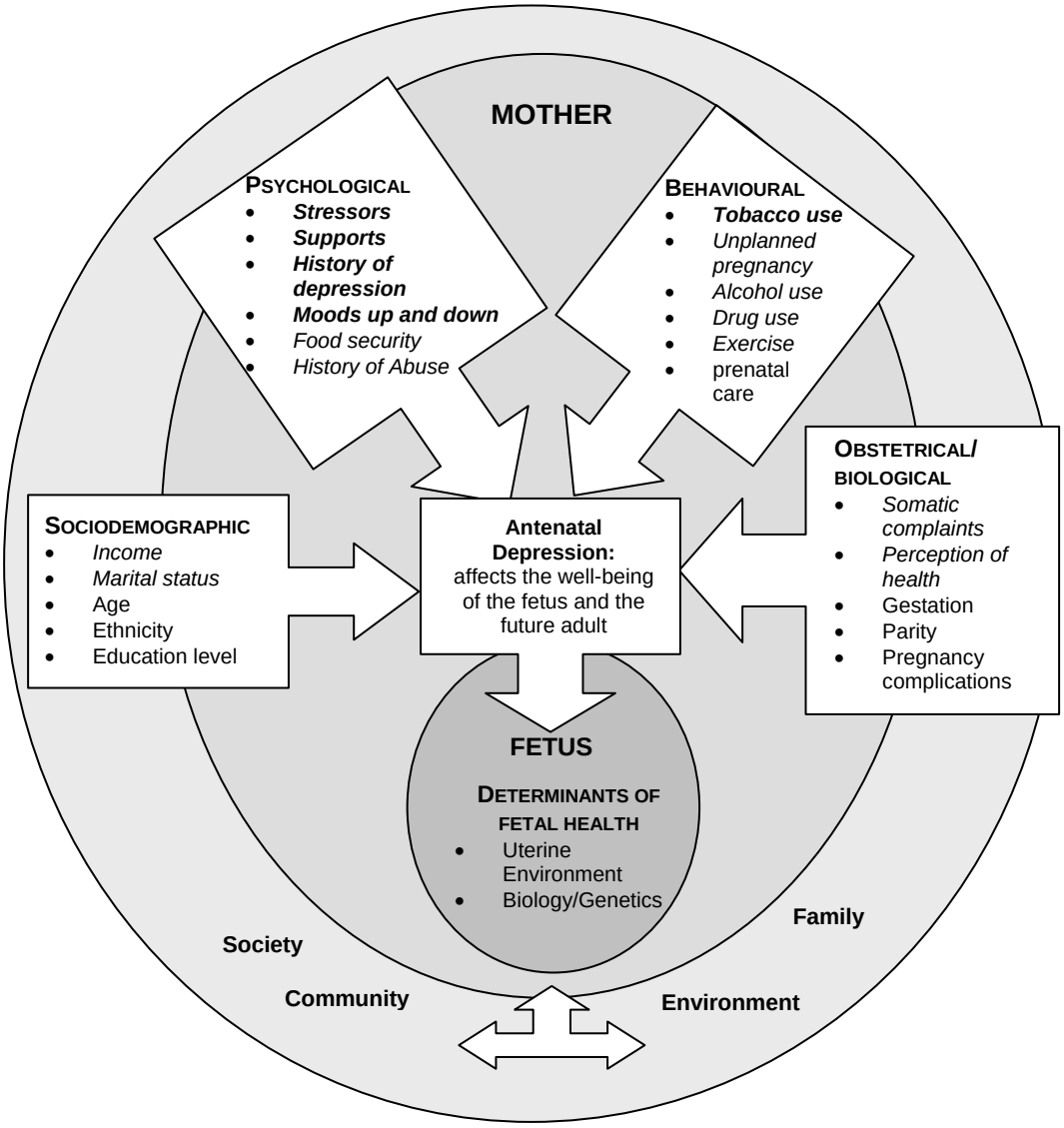
The majority of women in the study reported that they use prenatal vitamin supplements (82.6%), but unlike other studies there was no association with depressive symptoms.[10] This lack of association may be related to the fact that the nurses of the HMHB program distribute vitamin supplements to the women and they may not have been honest to the nurses about their vitamin use.

Some studies have found unplanned pregnancy has a significant association with depression.[224] This was important as almost three-quarters of the women in the study had not planned the present pregnancy, which was higher than the 50% of pregnancies that are usually reported as unplanned.[225] In a telephone survey of 300 women in Ontario, only 29% of the pregnancies were unplanned.[226] Unplanned pregnancy was associated with low education and low income in other high-risk samples of women.[69] There was a bivariate association between unplanned pregnancy and depression, but not planning the pregnancy was not significant in the final model.

Figure 6.1 summarizes the determinants of antenatal depression in this sample. The determinants of antenatal depression that were proposed as being in the study but were not significantly associated are in plain font. The determinants that were found to be significant in the bivariate analysis and each determinant are in italics. Finally, those determinants that were significant in the final model are presented in bolded font.

It appears from the final regression model that depression, in this sample of high-risk pregnant women, was related more to psychological determinants than to the other determinants analyzed in this study. Previous history of depression, mood swings, stressful events, and level of support all had strong and significant associations for depressive symptoms. The only behavioural determinant in the final model was current smoking status.

Figure 6.1 Determinants of antenatal depression



Bold italics font = In Final Model
Italics = Significant bivariate analysis
Normal font = No statistically significant association

6.3 Antenatal Depression in Aboriginal, Younger and Non-Partnered Women

The prevalence and determinants of depression were compared between the Aboriginal and non-Aboriginal, the women 21 years of age and under and those over 21, and non-partnered and partnered women.

6.3.1 Aboriginal women

The Aboriginal women in this study experienced significantly lower income (87.4% versus 68.9%), lower levels of education (72.5% versus 42.2%), and less of them experienced high levels of support (41.7% versus 69.2%) than the non-Aboriginal women did. Aboriginal women also had significantly more current or previous substance use: smoking (98.1% versus 68.7%), alcohol (91.2% versus 78.5%), and drugs (72.5% versus 60%). Aboriginal women had significantly higher levels of depressive symptoms and self-harm thoughts as measured by the subscales of the EPDS, but not on the overall EPDS score.

Other research has identified lack of significant difference in the prevalence of depression among women in ethnic minorities.[12, 67, 154] It may be that although the EPDS has been tested in multiple cultures, languages, dialects, and settings in prenatal and postnatal women throughout the world, including a group of urban Aboriginal women in Saskatchewan, that it does not detect depression as precisely in this group of women. The women may express their despair in different ways from other women. It might also mean that despite all the challenges and inequities that would be expected to put them at increased risk for depression, these women were resilient and tended not to get as depressed. Regardless of their life circumstances, it is interesting to note that only 39.7% of Aboriginal women stated that they had a history of depression compared to 52.3% of the non-Aboriginal women, but when they did have a history of depression, it was significantly associated with antenatal depression.

6.3.2 Women under 21

It was expected that women 21 and under would be at greater risk for depression as they would have other risk factors potentially associated with depression (e.g., non-partnered, lower income). Women under 21 were more likely to be non-partnered (65.0% versus 49.0%), to not have completed Grade 12 (77.0% versus 47.3%), to be in their first pregnancy (57.9% versus 21.0%), and they were significantly more likely to have used

drugs (75.6% versus 60.0%). Women 21 and under did experience more depression: more of the younger women scored higher on the EPDS, but the difference was not statistically significant. Having their moods go up and down was significant for depression in both groups of women, but having low levels of support and self-rated health described as poor were significantly associated with depression in the final model of the women over 21.

6.3.3 Non-partnered women

It was expected that the non-partnered women would be more likely to be depressed because of their potentially lower income, younger age, and lack of support. The non-partnered women in this study were significantly more likely to be younger, be on social assistance, rate their overall health as poor, and reported less supports and more stressors. Research has shown that pregnant women's smoking habits echo that of their peers and partners and that they are more likely to quit if their partner also quits and supports their abstinence, so it could be expected that non-partnered women would smoke more as they lack the support to quit.[219] Indeed, more non-partnered women in this study smoked than partnered women (59.4% versus 48.5%).

One might expect that given the prospect of lone parenthood, the non-partnered women in this study would experience more depressive symptoms than the partnered women, but the difference was not significant. This is in contrast to other studies.[12, 67, 69] But as with other research, the rate of depression was highest in the separated/ divorced/widowed group (OR 1.72, 95% CI 1.31, 2.23),[69] but very few women in this study fell into this category: most were either never married or in a partnered relationship (married or common-law). It may be that these non-partnered women, who were mostly on social assistance, were reluctant to report their relationship status due to fear of being penalized by social services through discontinuation or lessening of their funding.

6.4 Factors of the EPDS

Consistent with other studies, this study confirmed that the EPDS measures not one but different factors of depressive mood such as anxiety.[155-157, 227] Adouard et al.[227] found two factors somewhat similar to those in this study in 60 women in obstetrically high-risk pregnant woman, with the 'anxiety' factor accounting for the greater amount of the variance in the total score. Self-harm thoughts were included in this first factor. The

researchers used a principal component rather than an exploratory factor analysis, which may have limited expression of further factors.

While the anxiety subscale was the prominent feature in this sample of pregnant women, it was the depressive symptom subscale, which explained most of the variance in 150 postpartum Canadian women (27.0% postpartum versus 20.1% in the pregnant women).[156] Both studies had reported the factor composition and variance of the anxiety factor similar to this study (25.2% versus 25.4%). The third factor, self-harm thoughts, explained similar magnitude of variance in both studies: 13.6% in the pregnant women and 14.7% in the postpartum women.[156]

As with studies of the general population,[228] there were significantly more anxiety symptoms in the younger women. There was no significant difference between anxiety symptoms between either the Aboriginal and non-Aboriginal women or the non-partnered and partnered women. Other researchers have found a history of depression was strongly associated with anxiety in pregnancy, [229] and women in this study were more than four times as likely to have anxiety symptoms compared to women without a history of depression.

6.4.1 Self-harm thoughts

Suicide in pregnancy may be rare,[57, 81] but as this study confirms, self-harm thoughts were not uncommon in this group of pregnant women. According to Statistics Canada, 3.8% of all women will have had suicidal thoughts in the last year, with the highest rate of all age categories, in both genders, in the women in the 15-24 year age group (7.3%).[230] However, 20% of women in this study had self-harm thoughts in the past seven days. The highest level was in the women with symptoms of major depression, followed by those women currently using alcohol. This comorbidity of increased suicidal thoughts and alcohol use was also affirmed by Homish et al.[187] While there was the expected increase in the self-harm thoughts in the younger women in this sample (23.3%), this was not a significant increase, and only 0.6% stated that they had thought of self-harm often in the last seven days.

6.5 Implications for Future Research

Currently, building on the research in this thesis, research is underway on antenatal and postnatal depression on a larger sample of 650 women from the general

population in Saskatoon, Canada. As a result, we were able to train and hire interviewers whose only role is to collect the data. We have included all of the questions from this original study, but also added other items and questionnaires based on preliminary data analysis from this study.

For example, to more fully understand the sources of anxiety and stressors, we have included the Cambridge Worry Scale,[231] which measures specific worries in early and late pregnancy as well as in the postpartum. Because of the significant association of nausea and vomiting with depression in this study and others,[49] we have added a tool that more accurately measures nausea and retching, as well as the amount of vomiting in pregnancy.[232] Measures were also added about the impact of neighbourhood characteristics on antenatal depression.

Having moods that go up and down was significantly associated with depression in this study. Therefore, we have included more questions about mood and a visual analogue scale of moods at that time, and we have started a small substudy to explore mood changes in pregnancy in greater detail. Women will record their mood symptoms twice a day for one week on three occasions. We will be able to compare the data to studies in non-pregnant women with and without premenstrual syndrome (PMS), and to women with alcohol problems.

Alcohol use was an important comorbid factor in depression severity and suicide thoughts, but it is also harmful to the fetus.[188] We have incorporated additional and more specific questions about alcohol use taken from the Canadian Community Health Survey[233] and the TWEAK.[203] We also included two questions adapted from the PRIME-MD "Over the past two weeks, have you ever felt down, depressed, or hopeless?" and (2) "Have you felt little interest or pleasure in doing things?" that have been validated to establish depressive status in obstetric, gynaecologic, and other populations.[234, 235]

While this and the ongoing longitudinal study will provide ample quantitative data to describe the prevalence and determinants of antenatal depression, it is also important to understand women's lived experiences with antenatal depression. We have funded a graduate student to conduct a qualitative study of women experiencing their first depression in their present pregnancy.

While the EPDS has been extensively validated worldwide in many cultures, languages, and in community samples of pregnant women, it was not validated in this sample. An attempt was made early on to engage a psychiatric resident in the project but this was not feasible at this time.

6.6 Lessons Learned

I have been asked how I chose a thesis topic that would be of such interest and significance. This was not intentional. While completing two CUISR (Community-University Institutes for Social Research) projects, one an evaluation of the Postpartum Depression Group[146, 206] and the other an evaluation assessment of the HMHB program,[146, 206] I noticed that women seeking help from postpartum depression were more likely to be married, well-educated, and Caucasian than the women participating in the HMHB. I recognized that given the inequities in the sociodemographic status of these different groups of women, surely the women at HMHB would be at high-risk for depression. Once I reviewed the literature and realized that antenatal depression was a significant problem with the potential to have a profound effect on the health of pregnant women and their babies, I became passionate about conducting this study.

Starting a new facet of my career after 30 years in nursing has been exciting, but research was also an arduous process. I have learned to be patient with tasks outside my immediate control, such as ethics approval and data collection. I have also been involved in preparation, submission, and success with grants on the local and on a national level. I have successfully endured the rigors of publishing two articles from the development of this project in refereed journals and have another submitted.

6.7 Summary

This study confirms the high prevalence of depression and self-harm thoughts in a high-risk group of 402 pregnant women in Saskatoon, Canada. It has identified a model of determinants for antenatal depression that were unique to the women this study: history of depression, moods up and down, stressors, cigarette smoking, and unplanned pregnancy. The study also confirms the existence of multiple factors within the EPDS including a predominance of anxiety rather than depression symptoms in pregnancy compared to postpartum women, and significantly increased anxiety in the younger women.

CHAPTER 7

CONCLUSIONS: IMPLICATIONS FOR PRACTICE, POLICY, AND KNOWLEDGE TRANSLATION ACTIVITIES

According to the World Health Organization, the prevalence of depression is increasing and is exacting a huge public health burden on society.[2] Along with the physical and psychological changes associated with pregnancy, high-risk women face daily challenges with financial hardships, family violence, lone parenthood, greater numbers of children, and low education compared to women in the general population. Their circumstances must be framed, studied, and be met with policy interventions for relief at a primary, secondary, and tertiary prevention as well as a population approach to improve their health and the health of their growing families. This includes improving the socioeconomic status of women, providing social support, increasing our understanding of the unique factors that contribute to depressive symptoms in women, and testing interventions that are effective to relieve the misery they experience and the effects on the whole family.

This study confirmed that almost 30% of these high-risk women are experiencing high levels of depressive symptoms. As well, there are implications for practice, theory, policy, and knowledge translation.

7.1 Implications for Practice

Childbirth is a time of increased contact with health services. This provides a unique opportunity for the early detection of maternal depression. Screening and increased awareness of antenatal and early postpartum depression and its associated risk factors will be of interest to primary prevention and outreach programs that focus on the care of pregnant women, particularly high-risk women, and their families. By providing information about the significant associated determinants in this sample of women (i.e., history of depression, moods going up and down, current smoking status, low support, and high levels of stressors), caregivers will be better able to recognize women at risk for

depression in pregnancy and in the early postpartum. Identification and early treatment of depression may help to decrease engagement in related risk behaviours and lifestyle choices such as smoking, alcohol, and drug use that negatively affect themselves, their pregnancies, and their children.

The project has increased awareness of antenatal and postnatal depression in Saskatoon. As a result of the study, local physicians who are now identifying depression in their pregnant clients requested access to specialized care. Therefore, in association with a psychiatrist who specializes in mood and anxiety disorders, Dr. Marilyn Baetz, we have initiated a Maternal Mental Health Program for pregnant and postpartum women suffering from mental illness, particularly depression, within a primary care centre in the Saskatoon Health Region. In addition, we were recently successful in getting funding from the Royal University Hospital Foundation in Saskatoon to conduct and evaluate the effectiveness of an Antenatal Depression Intervention Group.

7.2 Implications for Policy

Sobey blames the absence of public policy, the discrepancy between insurers for mental health coverage, and the lack of screening as the major reasons for lack of movement on strategies to prevent postpartum depression in the United States.[45] Screening is an effective strategy for reducing morbidity in depressed people[236] and screening women for depression in pregnancy and during the postpartum is used in increasing frequency in the United Kingdom and Australia.[153, 159] In Canada, British Columbia recently presented guidelines for perinatal depression screening and care.[237] Calgary has been evaluating all women at 6-weeks postpartum for depression using the EPDS. And in Ontario, the Best Start Program began a campaign to screen women for postpartum depression in March 2007.[238] These campaigns will promote primary and secondary levels of intervention for awareness antenatal depression.

There is presently no routine screening for antenatal depression in Saskatchewan, and women may not get help until they are very ill. For instance, over 60% of the women who sought help from the Postpartum Depression Support Program in Saskatoon had thoughts of harming themselves or their baby prior to calling for help.[206] Without a systematic method to detect for antenatal depression, women and their families will continue to suffer unnecessarily. Universal screening for depression in pregnant women

with the EPDS is a procedure that would take caregivers in Saskatchewan approximately five minutes to complete.

I have tried to get the EPDS included in the routine prenatal assessments by having it included in the provincial prenatal forms completed by all physicians and nurse practitioners in the province for each pregnant woman. The latest revision of the prenatal form is in progress but the group would only provide space for two questions. The two questions from the PRIME-MD scale (Over the past two weeks, have you ever felt down, depressed, or hopeless? and Have you felt little interest or pleasure in doing things?) were submitted for inclusion.[235]

7.3 Implications for Theory

Increased awareness of the frequency and effects of antenatal depression symptoms will promote primary prevention in women and the sequelae in their unborn children. Screening, early identification, and treatments during routine prenatal visits will increase secondary prevention. It may also help to decrease the stigma, shame, and guilt that often prevent women from seeking help for mental health problems in pregnancy. Screening women with the EPDS can quickly identify women with self-harm thoughts and potentially avert a tragedy.

The determinants of antenatal depression in this study point to psychological health (history of depression, moods going up and down, and high levels of stress). This speaks to a need for both primary and secondary prevention strategies to alleviate depressive symptoms in the mother. Identifying women with a history of psychiatric problems and stressors early can potentially prevent depression from developing or worsening in those who are vulnerable. Providing support with tobacco cessation may help women avert some depressions. Secondary intervention such as universal depression screening can decrease morbidity for the mother now,[236] promote primary prevention of postpartum depression[62, 66] and primary prevention of the effects of depression on the fetus.

7.4 Knowledge Translation Activities

Increasing awareness about the prevalence and understanding the determinants of depression in this high-risk population of pregnant women will help to inform administrators and caregivers within the Saskatoon Health Region of the extent of

depression in this group of women and the determinants that may prevent future depressions. They will be more able to develop public health policy and implement programs that are tailored to this group of women.

The participatory approach of this study design has included staff, management, and clients of both programs. The result is a screening process that they can use on an ongoing basis to identify individual women with depression and to monitor their risk factors and outcomes and referral to caregivers (Appendix B). It has included education about antenatal and postpartum depression to caregivers, administrators, community partners of the participating programs, the public, and most importantly to the women themselves (Appendix D).

The evaluation projects done for the Community-University Institutes for Social Research (CUISR) of the Postpartum Depression Group and the HMHB program are published online.[146, 206] The pilot study of this project was also a CUISR project. It was published in a refereed journal.[82] A poster of this thesis won Gold Poster Prize at the Canadian Institutes for Health Research, National Poster Competition at the Canadian Student Health Research Forum in Winnipeg in June 2007.

The knowledge translation activities for this project included information about antenatal depression in all women, not just those high-risk. This involved numerous oral and poster presentations at the local, national, and international level. An online learning resource for physicians was produced for Continuing Professional Learning at the College of Medicine at the University of Saskatchewan.[239]

7.5 Final Conclusions

As this study confirms, depression is a major public and mental health problem. Women in this high-risk sample were experiencing depressive symptoms and self-harm thoughts at an alarming rate. Younger women experienced higher levels of anxiety, which may lead to depression, including postpartum depression. The women with depression in this study were more likely to have had a history of psychological, mental health problems, and risk behaviours that put them at further risk for depression during pregnancy. The women have more pregnancies and their life circumstances were subject to more social inequality than other Saskatchewan women. This combination of factors

can only lead to ongoing mental and physical health problems for the women, their babies, and their families.

Using a population health approach to study antenatal depression can help to identify the unique sociodemographic, obstetrical/biological, psychological, and behavioural determinants of health that put women at further risk. This knowledge can help us to target interventions that will promote the early identification of women with mental health and stress problems before they start to have children. We need to educate people about the factors associated with depression, the signs and symptoms, and encourage them to seek help for women at risk or suffering from depression.

Because of the increased risk reported in this study, it is important to assist women with tobacco cessation before they become pregnant, to encourage young women not to take up smoking, and also to help them to avoid unplanned pregnancies. These primary prevention interventions will decrease the possibility of antenatal depression in vulnerable women and thereby reduce the exposure to the effects of depression in the developing fetus in the womb and decrease the chances of further depression and the sequelae in women.

Ultimately, the primary prevention of antenatal depression and its affects on the mother and the fetus will be successfully accomplished through increased understanding of the problem through research studies such as this one. This study will need to be followed by multiple levels of knowledge dissemination to further increase the attention of the public, professionals, and legislators to the levels of prevention outlined here. Policy and programming will need to ensure that early intervention is provided to improve the outcome of women's mental health in pregnancy and the postpartum and the lives of their children, in this and future generations.

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Appendix A. Summary of studies of depression in socially high-risk women

Author	Year	Site	Sample size	Gestation (weeks)	Tool*	Cut -off	% depressed	Psycho-metrics	Sample characteristics	Determinants of depression	Comments
Bolton et al. [67]	1998	London UK	407	24% -2nd trimester 75.6% -3rd trimester	EPDS	13	29		Age 29±5.47 33% primip 28.6% previous abortion 53.5% < Grade 12	RR with EPDS >15: Supportive partner:2.31 Single status: 2.43 Unemployed:2.35 Multiparous: 2.62 < Grade 12: 3.40	States good estimate of prevalence of depression-high- risk women.
Bowen & Muhajarine[82]	2006	Saskatoon Canada	39	15.5	EPDS	≥13	27		Age 23.2±4.1 44% primip, 66% single, 64% Aboriginal, 51% < Grade 12 75% current smoker	Higher mean EPDS in women who were Aboriginal, single, smokers, alcohol users, >21, no social support* *(p<0.01)	Small sample size
Da-Silva et al.[6]	1998	Brazil	33-assessed in home during pregnancy-only 29 finished antenatal assess.	'3rd trimester'	EPDS	≥13	37.9	Compared Clinical assessment Sensitivity-73% Specificity-90.5% in all participants (ante and post natal)	All low income, "100-500US$ a month" all other data reported as depressed versus non depressed	Bivariate associations Partner support -p<0.05; ethnic origin (Black) p<0.05	Portuguese validation study. Very small sample size. Antenatal depression was not associated with postpartum depression
Hobfall et al.	1995	Ohio, US	232	2nd and 3rd trimester	SADS, adapted for use ante & postnatal -RDC , BDI short interview		27.6 2nd trimester 24.5 3rd trimester 41.5% depressed on either assessment	Removed pregnancy related physical symptoms. SADS validated by interviews using BDI-II with 30 women 2-3 weeks post screen.	Age 24.5±5.1 24% < Grade 12 32.2% employed 87.6% low income 41.7% were single or un-partnered 27% African American	Only single, non cohabitating status associated with depression, no association with income, education, ethnicity, or employment	
Jesse et al.	2005	Mid-western US	130, but only 128 completed the depression	16-28 weeks	BDI II	18	27%, mean BDI-II 13.6±9.9	Did not adjust for somatic symptoms associated with	62% African American 58% partnered 33% < Grade 12 78% Medicaid insurance	More Caucasian women depressed. ORs: high religiosity 1.3 (p<0.05) high stress 1.2 (p<0.01) self-esteem 0.8 (p<0.01)	

Appendix A. Summary of studies of depression in socially high-risk women

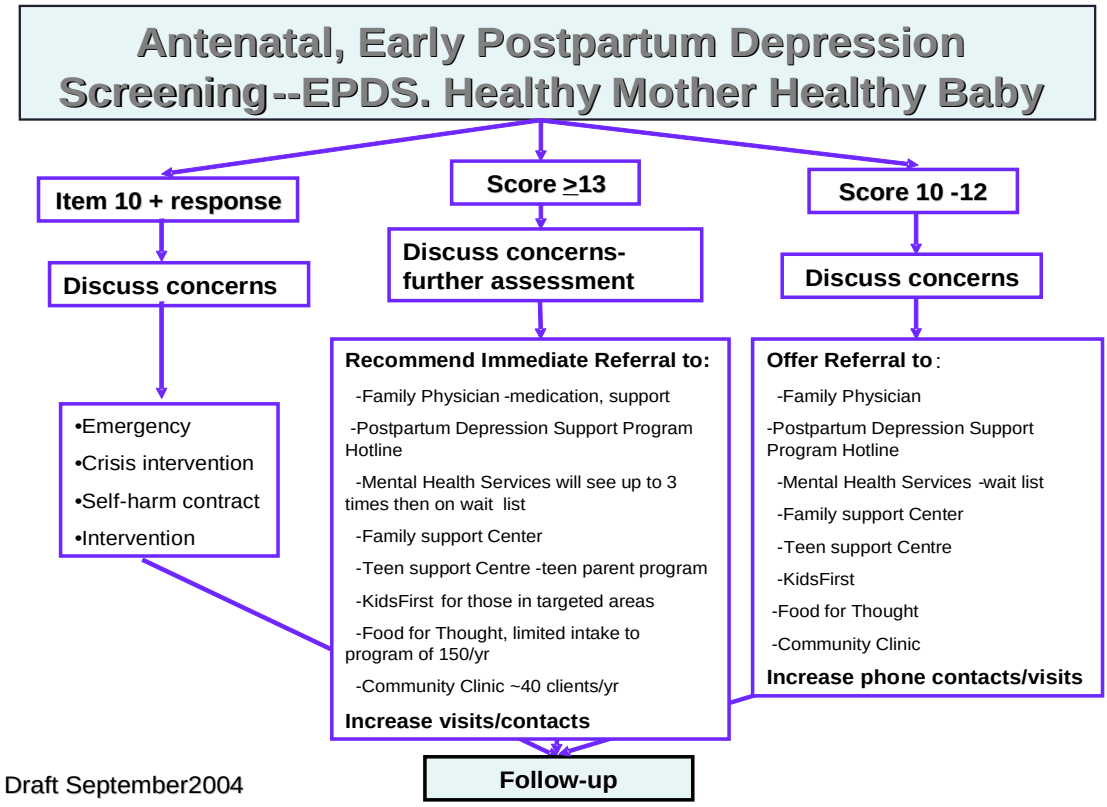
Author	Year	Site	Sample size	Gestation (weeks)	Tool*	Cut -off	% depressed	Psycho-metrics	Sample characteristics	Determinants of depression	Comments
			screen					pregnancy	39% currently smoked 28% substance use (unspecified)	adolescents significantly higher mean BDI-II scores (18.5 versus 12.25)	
Kim et al.[70]	2006	Minneapolis US	154, however 127 completed the psychiatric and substance abuse tools.	28±7 weeks	PRIME-MD-PHQ MDQ		25% depression 10% anxiety 31% psychiatric/substance abuse disorder	Did not adjust for somatic symptoms in pregnancy	Age 25±5.7 38% unmarried 67% social assistance, 80% ethnic minority (32% African American, 31% Hispanic, 7% Native American 3% alcohol abuse	Past psychiatric history/substance abuse and poor prenatal care (OR 2.76, 95% CI 1.22, 6.22)	Primary outcome: prenatal care utilization Only 61% of 154 signed consent.
Lovisi et al.[69]	2005	Brazil	230	37.7 weeks	CIDI		19.1%	CIDI based on ICD-10 criteria, high inter-rater reliability Diagnosed major depression, single, or recurrent in past 12 months	Age 27.6+5.8 25% single, 54.8% non white, 55.7% low education 24.8% history of depression	Divorced or widowed (OR 4.9, 95% CI 1.3, 18.3) history of depression (OR 7.9, 95% CI 3.1, 20.5) loss of intimate relationship (OR 8.4, 95% CI 3.3, 21.4) financial difficulties (OR 6.6, 95% CI 2.5, 17.2) family violence (OR 4.2, 95% CI 1.5, 11.8). secondary school education was protective (OR 0.5, 95% CI 0.2, 0.9). Women reported lack of emotional & social support but no link to depression	
Orr et al.[103]	2002 published (study -1992-3)	Baltimore US	1,399	Recruited first prenatal visit	CES-D	16		Prospective study	81% ≥20; 75% >Gr. 12; 78% single; 25% current smoker; 7% current alcohol use; 9% current drug use;		Main outcome was spontaneous preterm delivery, depression (OR 1.96, 95% CI 1.04, 3.72) for preterm delivery. No evidence of dose response of depression.

Appendix A. Summary of studies of depression in socially high-risk women

Author	Year	Site	Sample size	Gestation (weeks)	Tool*	Cut -off	% depressed	Psycho-metrics	Sample characteristics	Determinants of depression	Comments
Orr et al.[211]	2006	North Carolina, US	1163	First prenatal visit	CES-D	16 23	49.1% Black 33.5% White 27.% Black 16.2% White		Age 78%≥20 70.6% <Grade 12 56% single Black women more likely to not finish Gr. 12 or married	Black ethnicity(OR 1.54, 95% CI 1.16, 2.05); < Gr. 12 (OR 1.62, 95% CI 1.22, 2.15); single (OR 1.72, 95% CI 1.31, 2.23)	Study was to compare differences between black and white women
Vander Weg[219]	2004	Memphis, TN	245	Not reported	CES-D	16	% not reported. Mean CES-D 21.5±11.2	States tool valid in pregnancy. Did not state if adjusted for somatic symptoms of pregnancy	Age 25.6±5.2 41.6% African American, 54.3% low income, 31% employed, 60% < Grade 12, 65.5% single, 78% current smokers, 14.3% current marijuana use	Multivariate correlates (n=239) Self efficacy (partial regression coefficient -.88, p<0.001; marijuana use 7.1, p<0.001; self efficacy for quitting smoking 1.2 p=0.024; self efficacy for quitting when depressed-3.5, p=0.032; nicotine dependence .631, p=0.035	Primary outcome: smoking in low income pregnant women

*CIDI- Composite International Diagnostic Interview; SADS-Schedule for Affective Disorders and Schizophrenia; RDC-Research Diagnostic Criteria for minor and major depression- Gold Standard; BDI-II – Beck Depression Inventory II; PRIME-MD-Primary Care Evaluation of Mental Disorders; MDQ-Mood Disorders Questionnaire

Appendix B



Draft September2004

Appendix C

Healthy Mother Healthy Baby Program
9th Floor, Sturdy Stone Centre, Saskatoon, SK S7K 2H6
306-655-4806

Date:_____

Dear Dr:_____

_____ is a client of the Healthy Mother Healthy Baby program. We are presently involved in a research study that involves screening women for potential depression. The score on the depression screen indicates that _____ may be at risk for depression. We are referring her to you for further assessment.

Thank you,

_____RN
Maternal Child Nurse
Healthy Mother Healthy Baby

Appendix D

Feelings in Pregnancy

and Motherhood

Why am I feeling like this?

Pregnancy can change how you feel both physically and emotionally.

The first 3 months

When you first find out you are pregnant you are getting used to being pregnant. You may be excited but you can also feel more tired, emotional, and forgetful.

The second 3 months

You will feel the baby move and may start to feel more attached to it. Women usually feel physically and emotionally well during this time.

The last 3 months

This is often a time of increased worry about the pregnancy, delivery, and caring for the baby. You might feel less physically comfortable, have trouble sleeping, and feel more emotional.

Feeling sad and lonely during pregnancy may confuse you and leave you feeling guilty.

You are not alone, up to 30% of women experience some depression while pregnant.

Feelings in Pregnancy and Motherhood

The "blues" usually occur 3 to 4 days after the baby is born. Over 80% of women become teary, sad, and feel overwhelmed with changes of motherhood.

Most women recover from the blues in a few days. But 10-15% of women go on to have a postpartum depression.

Some signs that you are depressed

- Not enjoying things that you used to
- Loss of interest in things you usually like
- Low energy
- Crying or feeling teary for no reason
- Feeling irritable or more sensitive to things
- More tired or hyperactive
- Not being able to get to sleep or sleeping more
- Problems concentrating
- Forgetting things
- Feeling everything is your fault
- Feeling unable to cope with things in your life
- Anxiety, panic attacks or feeling scared for no reason
- Eating too much or too little
- Thoughts of harming yourself or others

Having some of these symptoms for more than 2 weeks might mean that you are depressed

Causes of depression

The exact cause of depression in pregnant women and new mothers is unknown but changes in hormones, stress or different life situations can put you at risk:

- History of depression or anxiety, especially with previous pregnancies or after birth of other children
- Family history of depression or emotional problems
- Being single, living with your parents
- Relationship or marital problems
- Being a teenager
- Loneliness or stress of belonging to an ethnic minority
- Stressful life event: divorce, job loss, death of someone close to you
- Unplanned pregnancy
- Lack of support
- Financial and housing worries
- Low education
- Difficult pregnancy

Untreated depression may be harmful to you, your baby, and your family

Depressed Mothers have:

- More and worse depressions in the future
- Chance of psychosis
- Increased blood pressure
- More premature or c-section deliveries
- More smoking, drinking, and using drugs, which are harmful to you and your baby
- Less likely to enjoy or to breastfeed your baby

Baby: The baby may be born early; this could be a problem for you and the baby. Babies of depressed moms:

- are more fussy
- weigh less
- are overall less healthy
- higher risk of SIDS

Children: Children are more likely to be depressed themselves. They have more social, behavior, discipline, and school problems.

Partners: Partners of depressed women are more likely to be depressed, especially if they don't understand what is happening.

Help is available

Counseling, exercise, light therapy, short hospital stay, or medications may help you feel better.

Enjoying a balanced diet may help your physical and mental health

- Whole grains
- Fruits & vegetables
- Meats & alternatives
- Dairy

Foods that might help how you feel:

- Whole wheat/grain bread, cereal, pasta
- Orange juice
- Dairy products: Milk, cheddar cheese
- Nuts and Sunflower seeds
- Salmon and tuna
- Turkey
- Dark green vegetables like spinach

Folic acid and vitamin supplements are important for the baby but also can improve how you feel

Some vitamins are destroyed by alcohol, nicotine, high-sugar foods, and caffeine.

Partners, families, and friends can help

- show support
- accept the woman's feelings
- learn about and being aware of the symptoms of depression in the woman and themselves
- encourage rest, relaxation, and healthy living
- help with other children and chores

Other things that may help

- Talk to someone you trust
- Tell your doctor or other health care provider how you feel

- Rest
- Go for walks or other exercise

- Eat well
- Avoid alcohol, smoking, drugs

- Learn about pregnancy and baby care
  - prenatal classes
  - ask questions

- Try to reduce your stress
  - avoid major moves
  - stick to your budget

Local Resources

- Your family Doctor _____
- Postpartum Depression Support Program-Hotline 221-6806
- Healthy Mother Healthy Baby 655-4633
- Saskatoon Community Clinic 652-0300
- School Counselor_____
- Mental Health Services 655-7950
- Addiction Services 655-4100
- White Buffalo Youth Lodge 653-7676
- Mobile Crisis Service 933-6200
- Catholic Family Services 244-7773
- Family Support Services 933-7751
- Emergency
  - RUH 655-1000
  - St. Paul's 655-5000
  - City Hospital 655-8000 (9am 7pm daily)

2004 ©Healthy Mother Healthy Baby
Saskatoon Health Region (306) 655-4633

Community Health and Epidemiology
University of Saskatchewan (306) 966-7930

Saskatoon, SK Canada

Appendix E Initial Antenatal and Early Postpartum Depression Screening Study Protocol-changes were communicated in the staff communication book.

Include:

1. All women who understand English (include teens); you can explain items to women but try not to guide their responses.
2. Women who intend to keep their baby.
3. Only women less than 20 weeks can be included to start in the study. Although this does not prevent you from screening any woman you are concerned about, but they will not be part of the study.
4. The data on women who miscarry, still birth etc will be used as is (e.g., just Time 1 or Time 2) but they should NOT be given the study questions following the loss.
5. Women who withdraw from the study will not have their data included in the study.
6. All women must sign the consent before entering the study; please leave a copy of the consent with the woman.

Data collection:

1. Please ensure that the study #___ and site (HMHB, WC, etc.) is on each sheet. Check all that apply if the client belongs to more than one e.g., HMHB and WC.
2. Please try to get as many items filled completed as possible.
3. The EPDS (Feelings in Pregnancy and Motherhood) and Lifestyles Questionnaire need to be completed at the same visit.
    a. Please always have the woman complete the EPDS first and in private.
    b. While you are scoring the EPDS, please give her the Lifestyles questionnaire to complete. You can then discuss the score and potential course of action.
4. Please try to have everyone who enters the study complete all 3 Times of the study.
5. Please use all of the appropriate tools at each Time: 1, 2, or 3.
6. Please try to complete data collection early in the week, in case any follow-up is required.
7. The original EPDS and Lifestyles questionnaire remains with the chart; the score sheet is returned to the manager and then to the researcher.

Time 1. Less than 20 weeks:
Tools—Yellow

- Consent
- Intake Assessment
- If possible do the EPDS, Lifestyle questionnaire, and Score Sheet, if not can do at next visit
- Pink brochure “Feelings in Pregnancy and Motherhood” can be given out at any time

Time 2. Greater than 20 weeks and prior to delivery and more than 10 weeks since Time 1.
(i.e., if Time 1 is done at 17 weeks try not to repeat it until 28 weeks)
Tools--Lavender

- EPDS, Lifestyle questionnaire, score sheet

Time 3. In the first three weeks after delivery
Tools--light green

- EPDS, score sheet, lifestyle questionnaire
- Discharge database

If there are any questions, they or you can call 966-7930 - Angela or Dr. Muhajarine.

Appendix F

Healthy Mother Healthy Baby

CLIENT INTAKE INFORMATION

Referral Date: HMHB#
Assessment Date: Health Card #
DOB: Day Month Year **AGE:** **EDC:** Day Month Year

NAME_____
Surname First
Do you use any other name?_____
Address: _____Postal Code:_____ ____
Phone Number _____ Cell Number _____ ☐No Phone
Alternate Contact:_____Phone#_____

HOUSING ☐ own ☐ rent ☐ parents ☐ room & board ☐ YWCA ☐ other
# of adults in household_____ # of children under 18_____

Adequate/suitable ☐yes ☐no ☐unknown Plan to move: ☐yes ☐no when?____

Do you have any financial concerns: ❑Yes ❑No
Are you getting? ❑DCRE ❑Employment Supplement ❑Band funding ❑ Student loan ❑PTA
❑parents ❑partner ❑_____ _____

Do you work? ❑Yes ❑No ❑Work where?

In the past 12 months, did you or anyone else in your house.
Not have enough food to eat? ❑Yes ❑No
Worry that there would not be enough to eat because of a lack of money? ❑Yes ❑No

Are you? ❑single ❑CL ❑married ❑divorced/separated ❑widowed

CURRENT RELATIONSHIP WITH BABY'S FATHER? ❑Yes ❑No

HOW SATISFIED ARE YOU WITH THE RELATIONSHIP? ❑ very ❑ somewhat
❑ not satisfied

EDUCATION: What grade did you finish? ☐ Grade 8 or less ☐ Grade 9 – 11 ☐Grade 12 ☐Some post-secondary ☐Post-secondary ☐Some University ☐University

ETHNIC BACKGROUND
Are you? ☐ Caucasian ☐ Treaty –Status ☐ Non-Status ☐ Métis ☐ Other

PAST BIRTHS/ PREGNANCIES: G___P___T___P___A___L___

NAME	DOB	M F	Birth Wt	Gest	Complications/Comments	Anomalies or problems with child

HEALTH HISTORY-check which things you have experienced problems with

- ❑ severe nausea/vomiting
- ❑ spotting/bleeding
- ❑ headaches
- ❑ UTI
- ☐ vaginal infection
- ☐ STIs
- ☐ Hepatitis
- ☐ HIV
- ☐ Strep B
- ☐ anemia
- ☐ Rh factor
- ☐ diabetes
- ☐ seizures
- ☐ thyroid
- ☐ heart disease
- ☐ allergies
- ☐ surgeries
- ☐ other

PRESENT PREGNANCY

Date of first pregnancy check-up_____ Who did you see? ❑Doctor_____

What birth control did you use? ❑none ❑condom ❑BCP ❑Mirena/IUD ❑Depo other_____

Did you plan this pregnancy? ❑ Yes ❑ No ❑ sort of

Do you plan to keep the baby? ❑ Yes ❑ No

How do you feel about the pregnancy? ❑happy ❑scared ❑overwhelmed ❑ not happy

How does your family feel about the pregnancy? ❑happy ❑unsure ❑overwhelmed ❑not happy

How would you rate your overall health today? ❑Excellent ❑Very Good ❑Good ❑Fair ❑Poor

Do you plan to breastfeed? ❑Yes ❑No ❑Undecided
Are you interested in Prenatal Classes? ❑Yes ❑No ❑Undecided

CURRENT PREGNANCY-please check those that apply

❑ severe nausea/vomiting	❑ incompetent cervix	❑ anemia
❑ spotting/bleeding	❑ premature labour	❑ Rh factor
❑ cramps	❑ PIH/Swelling	❑ Diabetes
❑ headaches	❑ UTI	❑ dental problems
❑ multiple preg	❑ vaginal infection	❑ other
❑ placenta previa	❑ StrepB	

Medication	Reason	Amount	Frequency

MENTAL HEALTH/EMOTIONAL/PSYCHOLOGICAL HISTORY

Do you have a history of depression? ❑Yes ❑No When_____ Treated ❑Yes ❑No Medication ❑Yes ❑No

Did you have depression in previous pregnancy? ❑ Yes ❑ No when____ Treated ❑Yes❑No Medication ❑Yes ❑No

Have you had postpartum depression? ❑Yes ❑No when____ Treated ❑Yes ❑No Medication ❑Yes ❑No

Do your moods go up and down? ❑Yes ❑No

Did your mother or any of your sisters have depression before or after giving birth? ❑unknown

Mother ❑ Yes ❑ No sister: 1 ❑ Yes ❑ No 2.❑ Yes ❑ No 3.❑ Yes ❑ No

What things are causing you the most stress right now? ❑nothing right now

❑being pregnant ❑ partner/relationship ❑not enough money ❑children ❑family

❑where I live ❑ health of my baby ❑birth of my baby ❑health ❑work ❑school

❑ Other _____ _____

Do you have someone to turn to for emotional support? ❑Yes ❑No If yes, who gives you support?

❑ Partner ❑ Mother ❑ Friend ❑ Female relatives ❑ Other_____

Who of these gives you the most support? _____

Can you count on that person to care about you no matter what? Yes ❑ No ❑

Has anyone ever hit, slap, restrained, punch, pinch, kick, beat you? ❑ Yes ❑ No

Has anyone ever yell, belittle, berate, blame, neglect? ❑ Yes ❑ No

Has anyone touched you against your will, raped you? ❑ Yes ❑ No

Have you had counselling in the past? ❑ Yes ❑ No

If yes, what for? ❑ depression ❑ relationship ❑ addiction ❑ eating disorder ❑ abuse ❑other _____

Are you seeing a counsellor right now? ❑ Yes ❑ No

If yes, why? ❑ depression ❑ relationship ❑ addiction ❑ eating disorder ❑ abuse

Do you have any legal problems? ❑ Yes ❑ No

Date: _____ Interviewer:_____

#_____ **EARLY PREGNANCY**

How much do you exercise? (walking for 20 minutes, swimming etc.)

Every day ❑
2-3 times a week ❑
Occasionally ❑
Never ❑

How much do you smoke? (√ one)

More than a pack/day ❑
5-20/day ❑
Less than 5 a day ❑
Quit since pregnant ❑
Quit before pregnant ❑
I never smoked ❑

If you do/did smoke cigarettes, how old were you when you started smoking?_____
Does anyone else smoke inside your home? Yes❑ No❑

How often did you drink beer or other alcohol? (√ all that apply)

Occasional drink or 2 ❑
1-2 drinks a day ❑
5+ drinks at one time ❑
Quit since pregnant ❑
Quit before pregnant ❑
I never drank alcohol ❑

If you do/did drink alcohol, how old were you when you started drinking?_____
How often did you use drugs such as marijuana, crystal meth. cocaine? (√ one)

Regular (every day) ❑
Occasionally ❑
Quit since pregnancy ❑
Quit before pregnant ❑
I never use such drugs ❑

If you do/did use drugs, at what age did you start using drugs?_____

Your family income: (√ <u>one only</u>)

Social/Band assistance ❑
Less than $20,000./yr ❑
$20,000 -39,000./yr ❑
$40,000 -60,000./yr ❑
More than $60,000./yr ❑Other _____

Is there anything else you would like to say about how you feel right now?

Thank you for your time today

Appendix G **Westside Clinic** #____ Today's Date_____

Where do you live? ☐own house ☐rent house/apartment ☐live with parents ☐room & board ☐YWCA ☐other
# of adults in household_____ # of children under 18_____ Adequate/suitable Yes❑ No❑
☐unknown Plan to move: Yes❑ No❑ when? _____

Do you have financial concerns: Yes❑ No❑
In the past 12 months, did you or anyone else in your house
Not have enough food to eat? Yes❑ No❑
Worry that there would not be enough to eat because of a lack of money? Yes❑ No❑

Do you work outside your home? Yes❑ No❑
Are you? ❑Single ❑Common Law ❑Married ❑Divorced ❑Separated ❑Widowed
Are you in a relationship with baby's father ❑Yes ❑No
How satisfied are you with the relationship? ❑very ❑somewhat ❑not satisfied

Are you? ❑Treaty Status ❑Non Treaty ❑Métis ❑Caucasian ❑Other: Band_____
What grade did you finish? ☐ Grade 8 or less ☐Grade 9-11 ☐Grade 12 ☐Some post-secondary ☐Post-secondary ☐Some University ☐University

What birth control do you use? ❑none ❑condom ❑birth control pill ❑Mirena/IUD ❑DepoProvera ❑other
Did you plan this pregnancy? ❑Yes ❑No ❑ sort of
Do you plan to keep the baby? ❑Yes ❑No

How do you feel about the pregnancy? ❑happy ❑scared ❑overwhelmed ❑not happy
How does your family feel about the pregnancy? ❑happy ❑unsure ❑overwhelmed ❑not happy

Do you plan to breastfeed? ❑Yes ❑No ❑Undecided
Do you plan to go to prenatal classes? ❑Yes ❑No ❑Undecided

Have you had depression before? ❑Yes ❑No when_____ treated ❑Yes ❑No Medication❑Yes ❑No
Were you depressed in other pregnancies? ❑Yes ❑No when?_____ treated ❑Yes ❑No Medication❑Yes ❑No
Have you had Postpartum depression? ❑Yes ❑No when_____ treated ❑Yes ❑No Medication❑Yes ❑No
Do your moods go up and down? ❑Yes ❑No

Did your mother or any of your sisters have depression before or after giving birth? ❑Yes ❑No ❑Unknown Mother❑Yes ❑No sister1.❑Yes ❑No 2.❑Yes ❑No 3.❑Yes ❑No

Has anyone ever hit, slap, restrained, punch, pinch, kick, beat you? ❑Yes ❑No
Has anyone ever yell, belittle, berate, blame, neglect? ❑Yes ❑No
Has anyone ever touched you against your will, raped you? ❑Yes ❑No

Have you had counselling in the past? ❑Yes ❑No
If yes, what for? ❑depression ❑relationship ❑addiction ❑eating disorder ❑abuse ❑other
Are you seeing a counsellor right now? ❑Yes ❑No
If yes, what for? ❑depression ❑relationship ❑addiction ❑eating disorder ❑abuse ❑other
Do you have any legal problems? ❑Yes ❑No
How would you rate your overall health today? Excellent❑ Very Good❑ Good❑ Fair❑ Poor❑
What things are causing you the most stress right now? ❑nothing right now

❑being pregnant ❑ partner/relationship ❑not enough money ❑children ❑family
❑where I live ❑ health of my baby ❑birth of my baby ❑health ❑work
❑school Other ❑_____ _____ _____

Do you have someone to turn to for emotional support? ❑Yes ❑No if yes, who gives you support? ❑Partner ❑Mother ❑Friend_____ ❑Female relatives Other, who? _____
Who of these gives you the most support? _____
Can you count on that person no matter what? Yes❑ No❑

Are you in a relationship now? Yes❑ No❑
If yes, How satisfied are you with the relationship? very❑ somewhat❑ not satisfied❑
Are you seeing a counsellor right now? Yes❑ No❑:
If yes, for what? Depression❑ Stress❑ Relationship❑ Alcohol❑ Other❑ please specify _____

How much do you exercise? (walking for 20 minutes, swimming etc.)
Every day ❑
2-3 times a week ❑
Occasionally ❑
Never ❑

How much do you smoke? (√ one)
More than a pack/day ❑
5-20/day ❑
Less than 5 a day ❑
Quit since pregnant ❑
Quit before pregnant ❑
I never smoked ❑

If you do/did smoke cigarettes, how old were you when you started smoking?_____
Does anyone else smoke inside your home? Yes❑ No❑

How often did you drink beer or other alcohol? (√ all that apply)
Occasional drink or 2 ❑
1-2 drinks a day ❑
5+ drinks at one time ❑
Quit since pregnant ❑
Quit before pregnant ❑
I never drank alcohol ❑

If you do/did drink alcohol, how old were you when you started drinking?_____
How often did you use drugs such as marijuana, crystal meth. cocaine? (√ one)
Regular (every day) ❑
Occasionally ❑
Quit since pregnancy ❑
Quit before pregnant ❑
I never use such drugs ❑

If you do/did use drugs, at what age did you start using drugs?_____
Your family income: (√ <u>one only</u>)
Social/Band assistance ❑
Less than $20,000./yr ❑
$20,000 - 39,000./yr ❑
$40,000 - 60,000./yr ❑
More than $60,000./yr ❑

Is there anything else you would like to say about how you feel right now?

Thank you for your time today

Appendix H Validation and Psychometric Properties of the EPDS

Author	Sample size	Ante-natal (weeks)	Post-natal (weeks)	Cut-off	Psychometric properties, tools, analysis	Interpretation, comments
Adouard[227]	60	28-34 weeks		11.5	Compared with HAD and diagnostic interview with psychiatrist Sensitivity-80% Specificity-80%	Validation of EPDS in obstetrically high-risk women in France
Beattie[154]	117		Varied	11.5	Sensitivity-94% Specificity-86% PPV-56% NPV-99%	Major depression; Urban Aboriginal women
Bolton et al.[67]	407	Antenatal clinic		12/13		States, good estimate of prevalence of depression- high risk women
Cox et al.[50]	84		6	12/13	Compared-RDC (SPI)[1] Sensitivity-86% Specificity-78% PPV-73%	Identified all women with PPD - original validation of EPDS
Da-Silva et al.[6]	218; 33- at home	'3rd trimester'	Not specified	≥13	Sensitivity-73% Specificity-90.5%	Low income. Brazilian validation study
Eberhard-Gran et al[240]	310; 56-examined		6	≥10	Compared[2] DSM-IV PRIME-MD: Sensitivity-100% Specificity-87.2%	Norwegian community sample-Validation Study
Harris et al.[241]	147		6-8	12/13	Compared-DSM-III psychiatrist interview Sensitivity-95% Specificity-93%	EPDS performed better than BDI-Sensitivity-68% Specificity-88%
Murray, Carrothers[242]	674		6	12	Compared-RDC (SPI)[1] Sensitivity 92.5% Specificity-88% PPV-56.8%	Community Mail-out Sample
Murray, Cox [152]	100	28, 34		≥14/15	Compared-RDC (SPI)[1] Sensitivity-100% Specificity-96% PPV-60% Major depression: misclassification 4%	100% sensitivity for major depression AD at scores 11-15 --original validation of EPDS in pregnant women Recommend 12/13 cut off

HAD-Hospital Anxiety and Depression Scale; RDC -Research Diagnostic Criteria for minor and major depression. SPI-Standardised Psychiatric Interview, community based semi-structured psychiatric interview. [2]DSM-III Diagnostic and Statistical manual of mental disorders. PRIME-MD-Primary Care Evaluation of Mental Disorders; MADRAS-Montogomery-Asber Depression Rating Scale; SCL-25-Hopkins Symptom Checklist.

Appendix I Feelings in Pregnancy and Motherhood #_____

Please underline the answer, which comes closest to how you have felt in the past 7 days:

I have felt happy:

Yes, most of the time
Yes, some of the time
No, not very often
No, not at all

In the past 7 days:

1. I have been able to laugh and see the funny side of things:
   As much as I always could
   Not quite so much now
   Definitely not so much now
   Not at all
2. I have looked forward with enjoyment to things:
   As much as I ever did
   Rather less than I used to
   Definitely less than I used to
   Hardly at all
3. I have blamed myself unnecessarily when things went wrong:
   Yes, most of the time
   Yes, some of the time
   Not very often
   No, never
4. I have been anxious or worried for no good reason:
   No, not at all
   Hardly ever
   Yes, sometimes
   Yes, very often
5. I have felt scared or panicky for no very good reason:
   Yes, quite a lot
   Yes, sometimes
   No, not much
   No, not at all
6. Things have been getting on top of me:
   Yes, most of the time I haven't been able to cope at all
   Yes, sometimes I haven't been coping as well as usual
   No, most of the time I have coped quite well
   No, I have been coping as well as ever
7. I have been so unhappy that I have had difficulty sleeping:
   Yes, most of the time
   Yes, sometimes
   Not very often
   No, not at all
8. I have felt sad or miserable:
   Yes, most of the time
   Yes, quite often
   Not very often
   No, not at all
9. I have been so unhappy that I have been crying:
   Yes, most of the time
   Yes, quite often
   Only occasionally
   No, never
10. The thought of harming myself has occurred to me:
    Yes, quite often
    Sometimes
    Hardly ever
    Never

Appendix J

#_____

Feelings in Pregnancy and Motherhood -SCORE SHEET **Gestation** _____**weeks**

1. I have been able to laugh and see the funny side of things:
   - As much as I always could **0**
   - Not quite so much now **1**
   - Definitely not so much now **2**
   - Not at all **3**

2. I have looked forward with enjoyment to things:
   - As much as I ever did **0**
   - Rather less than I used to **1**
   - Definitely less than I used to **2**
   - Hardly at all **3**

3. I have blamed myself unnecessarily when things went wrong:
   - Yes, most of the time **3**
   - Yes, some of the time **2**
   - Not very often **1**
   - No, never **0**

4. I have been anxious or worried for no good reason:
   - No, not at all **0**
   - Hardly ever **1**
   - Yes, sometimes **2**
   - Yes, very often **3**

5. I have felt scared or panicky for no very good reason:
   - Yes, quite a lot **3**
   - Yes, sometimes **2**
   - No, not much **1**
   - No, not at all **0**

6. Things have been getting on top of me:
   - Yes, most of the time I haven't been able to cope at all **3**
   - Yes, sometimes I haven't been coping as well as usual **2**
   - No, most of the time I have coped quite well **1**
   - No, I have been coping as well as ever **0**

7. I have been so unhappy that I have had difficulty sleeping:
   - Yes, most of the time **3**
   - Yes, sometimes **2**
   - Not very often **1**
   - No, not at all **0**

8. I have felt sad or miserable:
   - Yes, most of the time **3**
   - Yes, quite often **2**
   - Not very often **1**
   - No, not at all **0**

9. I have been so unhappy that I have been crying:
   - Yes, most of the time **3**
   - Yes, quite often **2**
   - Only occasionally **1**
   - No, never **0**

10. The thought of harming myself has occurred to me:
    - Yes, quite often **3**
    - Sometimes **2**
    - Hardly ever **1**
    - Never **0**

SCORE_____

REFERRAL ❑Refused reason_____

❑Family Physician ❑KidsFirst ❑Community Clinic ❑Crisis ❑Emergency ❑Mental Health Services ❑Counsellor ❑Other _____ Comments:

Appendix K Study of Feelings in Pregnancy and Motherhood: Consent

Please read this consent carefully and feel free to ask any questions that you have

Purpose of the Study: We hope this study will help us understand how women feel during and after pregnancy. You will be given 2 short questionnaires that will ask how you have been feeling and about your activities. The questions take about 10 minutes to complete. There are no right or wrong answers. The nurse will discuss the findings and any possible follow-up with you. The questionnaires will be given to you today, again when you are 26-32 weeks pregnant, and about 2 weeks after the baby is born.

Potential Risks: If any questions upset you, the nurse will discuss these concerns with you. If your responses to the questions indicate concerns about how you are feeling, the nurse may suggest that you see your family doctor or other health care provider. Some resources here in Saskatoon:

Doctor _____ Counsellor_____

Postpartum Support Program-hotline	655-4665	Mobile Crisis Service	933-6200
Mental Health Services	655-7950	Saskatoon Community Clinic	652-0300
Healthy Mother Healthy Baby	655-4633	Emergency: Royal University Hospital	655-1000

St. Paul's 655-5000, City Hospital 655-8000

Confidentiality: Confidentiality is assured; researchers will only have a number to identify you. The findings of the study will exist only as grouped completely anonymous data and kept on your chart. The findings will be shared with the program and may be used in a student thesis, presented at conferences, and published in journals. As required by the University of Saskatchewan, the completed questionnaires will be kept in a locked cupboard at the Healthy Mother Healthy Baby or Saskatoon Community Clinic until the study is over and then held for 5 years in a locked unit at the University of Saskatchewan by Dr. N. Muhajarine.

Right to Withdraw: You may withdraw from the study or refuse to answer individual questions for any reason, at any time, without any sort of penalty. Participation is voluntary and refusal to participate in the study will not result in any change in service or care provided. If you withdraw from the study, any data about you will be destroyed.

Questions: If you have any questions about the study, please ask the nurse or contact the researchers below at any point: Angela Bowen or Dr. Nazeem Muhajarine,
Department of Community Health and Epidemiology,
University of Saskatchewan. 966-7930

The University of Saskatchewan Behavioural Sciences Research Ethics Board approved this study on September 10, 2004. If you have any questions about your rights as a participant please call the Office of Research Studies at 966-2084.

Consent to Participate:
I have read and understood the above; I have had an opportunity to ask questions and my questions have been answered to my satisfaction.
I consent to participate in the study described above; I understand that I may withdraw this consent at any time without any effect on my care. A copy of this consent form has been given to me.

_____ _____ _____

Signature of Participant **Caregiver** **Date**

Appendix L

Request for Waiver of Parental Consent

Some of clients who will be included in the study are under 18 years of age. All pregnant teenagers in Saskatoon are offered an opportunity to be followed by Healthy Mother Healthy Baby (HMHB), any girls who are under age 18 will only be invited to join the study if they are or will be participating in the HMHB program. Girls under 18 who attend the Community Clinic will be referred to HMHB. These teenagers are considered by the Saskatoon Health Region to be emancipated minors and as a result, do not require parental consent for participation in the HMHB program or to receive any of the program benefits (vitamins, supplements), education, or assessments or for other procedures related to the pregnancy.

1. The waiver is necessary for a number of reasons:
    a. The HMHB program does not require parental consent
    b. Many of these participants are not living with their parents
    c. To ensure that the study questionnaire is completed at the appropriate time

2. Potential risks to the clients include some upset, while this is a potential risk, it did not occur during the pilot study.
    a. All of the clients under 18 are under the care of one of two Maternal-Child Nurses throughout their contact with the HMHB program, therefore this Registered Nurse will be available during administration of all aspects of administration of the questionnaire (the three times that the tool is administered: upon admission to the program, at 28-32 weeks, and 2 weeks postpartum).
    b. Clients are provided a list of potential contacts for help (in the consent form) and will be referred to their family physician and mental health services should the questionnaire indicate a need for help.

3. As emancipated minors, there is no consent required by the parents for any other aspect of care provided by HMHB. It may then be considered inappropriate by these participants for the study to give their parents the option to withdraw their daughter from the study.

The Maternal-Child Nurses who provide care to these participants work in conjunction with their teachers, social workers, and other caregivers and parents where appropriate. The Nurse will assess if the girl is mature enough (cognitively and emotionally) to complete the questionnaire.

Appendix M

UNIVERSITY OF SASKATCHEWAN
BEHAVIOURAL RESEARCH ETHICS BOARD
http://www.usask.ca/research/ethics.shtml

NAME: Nazeem Muhajarine (Angela Bowen) Beh 04-183
Community Health & Epidemiology

DATE: September 8, 2004

The University of Saskatchewan Behavioural Research Ethics Board has reviewed the Application for Ethics Approval for your study "Antenatal and Early Postnatal Depression: Prevalence and Correlates in a Sample of High-Risk Women in Saskatoon" (Beh 04-183).

1. Your study has been APPROVED.

2. Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Committee consideration in advance of its implementation.

3. The term of this approval is for 5 years.

4. This approval is valid for one year. A status report form must be submitted annually to the Chair of the Committee in order to extend approval. This certificate will automatically be invalidated if a status report form is not received within one month of the anniversary date. Please refer to the website for further instructions http://www.usask.ca/research/behavrsc.shtml

I wish you a successful and informative study.

Dr. Valerie Thompson, Chair
University of Saskatchewan
Behavioural Research Ethics Board

VT/ck

Office of Research Services, University of Saskatchewan
Room 1607, 110 Gymnasium Place. Box 5000 RPO University, Saskatoon SK S7N 4J8 CANADA
Telephone: (306) 966-8576 Facsimile: (306) 966-8597
http://www.usask.ca/research

Appendix N

Saskatoon Health Region

Research Services Unit
Strategic Health Information & Planning Services (SHIPS)
Joanne Franko, Manager
Suite 300 Saskatoon Square
410 22nd St E
Saskatoon, SK S7K 5T6
Phone: 306.655.3356 Fax: 306.655.3373

DATE: **September 23, 2004**

TO: **Angela Bowen, Community Health and Epidemilogy, U of S**

FROM: **Joanne Franko**
Manager, Research Services Unit

RE: **RESEARCH PROJECT ETHICS COMMITTEE (EC)#: B2004-183**
PROJECT NAME: Antenatal and Early Postnatal Depression: Prevalence and Correlates in a Sample of High- Risk Women in Saskatoon
PROTOCOL #: N/A

Saskatoon Health Region is pleased to provide you with operational approval of the above-mentioned research project.

Please advise me when the data collection phase of the research project is completed. I would also appreciate receiving a summary of the results for this research project. As well, any publications or presentations that result from this research should include a statement acknowledging the assistance of Saskatoon Health Region.

I would like to wish you every success with your project and encourage you to contact me if I can assist you with it.

If you have any questions, please contact my office at 655-3356.

Yours truly,

Joanne Franko

Joanne Franko, M.Sc.
Manager, Research Services Unit

cc: Annette Gibbins, Mgr., Healthy Mother, Healthy Baby, Sturdy Stone

Appendix Q WC Supplemental information #_____

Date of Birth _____ _____ _____ Age___ Postal Code _____ _____

Gestation when study done/first visit _____weeks

CURRENT PREGNANCY-please check those that apply		
❑ Severe nausea/vomiting ❑ Spotting/bleeding ❑ Cramps ❑ Headaches ❑ Multiple pregnancy ❑ Placenta previa	❑ Incompetent cervix ❑ Premature labour ❑ Hypertension (high blood pressure)/swelling ❑ Urinary Tract Infection ❑ Vaginal infection ❑ Strep B infection	❑ Anemia ❑ Rh factor ❑ Diabetes ❑ Dental problems ❑ Other

Medication / Vitamin	**Reason**	**Amount**	**Frequency**

PAST BIRTHS/ PREGNANCIES: G_____ P _____ T_____ P_____ A _____L_____								
NAME	DOB	M F	Birth Wt	Gest	Complications/Comments	Anomalies or problems with child	Breastfed	Lives with
G=all pregnancies; **P**≥20 weeks gestation; **T**=Term; **P**=Preterm, ≤37weeks gestation; **A**=miscarriage<20wks/abortions; **L**=living								

HEALTH HISTORY-check which things the woman experienced problems with

❑ Severe nausea/vomiting	☐ HIV	☐ Thyroid
❑ Spotting/bleeding	☐ Strep B Infection	☐ Heart disease
❑ Headaches	☐ Anemia	☐ Allergies
❑ Urinary Tract Infection	☐ Rh factor	☐ Surgeries
☐ Vaginal infection	☐ Diabetes	☐ Hepatitis
☐ Sexually Transmitted Infections	☐ Seizures	☐ Other
☐ Other		